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The Impact of Medicaid Expansion Under the Affordable Care Act on Accessibility and Availability of Primary Health Care

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By

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Abstract

The Affordable Care Act (ACA) sought to provide universal health insurance coverage for Americans through a combination of Medicaid expansions, insurance market policies, advance premium tax credits, among other reforms. Lawmakers intended to enforce Medicaid expansion through the ACA at the federal level. However, the June 2012 United States (U.S.) Supreme Court decision in *National Federation of Independent Business v. Sebelius* allowed states to opt-out of Medicaid expansion. As a result, states took different approaches to expand Medicaid eligibility.

This study uses data from the Inter-university Consortium for Political and Social Research (ICPSR) to analyze how opting in or out of Medicaid expansion has affected the likelihood of accessing primary healthcare in expansion states relative to non-expansion states. Using logistic regression methods, this study analyzed the changes in the patterns of clinic appointments among Medicaid patients in six states – Georgia, Illinois, Montana, New Jersey, Pennsylvania, and Texas before and after the major ACA insurance expansions. As a secondary contribution, this paper addresses concerns about the adequacy of primary health care to meet the increased demand for healthcare after the expansion of Medicaid insurance.

The impact of Medicaid expansion on the likelihood of accessing primary healthcare is not statistically significant. However, during the second year following Medicaid expansion in Illinois, New Jersey, and Oregon, average appointment wait times for Medicaid patients increased. In the post-Medicaid expansion period, a significant amount of appointments could be scheduled with mid-level providers which suggest issues in the availability of primary healthcare for Medicaid patients.

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Chapter I. INTRODUCTION

Background

In March 2010, Congress of the United States (US) enacted the Patient Protection and Affordable Care Act (ACA), a comprehensive reform that has overhauled the US healthcare system. Among other legislative goals, lawmakers designed the ACA to increase health insurance coverage, reduce healthcare costs, and enhance the quality of care provided. Prior to the ACA, major government-sponsored healthcare programs primarily covered only certain sections of the non-elderly population, such as children, pregnant women, and persons with disabilities. Americans mainly accessed private insurance through their employers and insurance companies would often deny individuals with pre-existing conditions or disabilities. Individuals who did not have access to employer-sponsored plans often had to pay exorbitant insurance premiums in the private individual market.

The ACA sought to expand health insurance coverage to these uninsured individuals in two ways. First, the ACA established three provisions, also known as "three-legged stool," to increase access to health insurance coverage. The ACA includes a guaranteed issue which sold insurance to anyone willing to pay, an individual mandate which requires all Americans to acquire health insurance or pay a tax penalty, and premium tax credits to help low-income individuals obtain insurance. Secondly, the ACA sought to increase health insurance coverage by bringing the most extensive and comprehensive amendments to the Medicaid program since its inception in 1965 (McDonough, 2012).

The ACA introduced an expansion of Medicaid eligibility to all nondisabled, childless adults earning up to 133% of the Federal Poverty Level (FPL). A 5% income disregard sets the actual income limit to 138% FPL. Per the U.S. Department of Health and Human Services' 2019 Federal Poverty Level guidelines, Medicaid effectively covers all individuals earning up to about $17,236.20 annually and approximately $35,535.00 for a family of four.

The federal government incentivized states to expand Medicaid eligibility under the ACA by paying the full cost of covering the newly eligible low-income individuals. The federal government fully covered the cost of newly eligible enrollees from 2014 through 2016. Medicaid funding provided by the federal government will gradually transition to 90% of the total costs by 2020. Thus, the state's share of cost Medicaid expansion under the ACA will never exceed 10% over the long-term (Hayes, Coleman, Collins, & Nuzum, 2019).

To further incentivize the states, the federal government decided to cut the existing federal Medicaid funding if states opted against expanding Medicaid. States challenged the ACA's Medicaid expansion provision in court. The U.S. Supreme Court's verdict in the *National Federation of Independent Business [NFIB] v. Sebelius* (2012) found the ACA's Medicaid expansion unconstitutionally coercive of states, as the federal government did not allow states adequate notice to voluntarily consent to the Medicaid expansion. While the Court limited the federal government's power to enforce Medicaid expansion, it upheld the constitutionality of the ACA's minimum essential coverage provision (individual mandate).

The Supreme Court's ruling essentially limited the federal government's enforcement authority. The ruling afforded states the flexibility to either continue at pre-ACA levels of funding and eligibility requirements or accept ACA's Medicaid expansion. This resulted in numerous contentious debates at the state level over whether to expand or opt-out of expanding Medicaid under the ACA.

Choosing whether to expand or to continue at pre-ACA levels of funding levels and eligibility requirements have so far proved to be a tough decision with many considerations. Significantly affected by state affluence, past policy trajectories, and administrative capacity (Jacobs & Callaghan, 2013), the number of states that have adopted Medicaid expansion has progressively grown from just a handful in 2012 to about thirty-seven states (including the District of Columbia) as of February 2019. *(Full list of states' expansion status is provided in the appendix)*

Complicating matters somewhat, some states are expanding Medicaid through the Section 1115 Waivers. Section 1115 of the Social Security Act mandates the Secretary of Health and Human Services (HHS) to waive specific provisions of some federal health and welfare programs according to his or her discretion. It allows states to use federal Medicaid funds in ways that are not conventionally allowed under the federal guidelines if the initiative is considered as a pilot or an experimental project. Thus, methods for expanding are different even for the thirty-seven expansion states.

Using the Section 1115 waiver to modify Medicaid expansion under the ACA gave states additional flexibility to design and improve their Medicaid programs. Section 1115 waivers are diversely implemented across states, ranging from comprehensive

legislation aimed at expanding Medicaid for only a segmented population to unrestricted reforms to enhance service delivery. The disparity in policy adoptions among all states has necessitated studies into the effects of taking different approaches to implementing Medicaid Expansion.

Research Problem

Historically, reforms to public health programs such as Medicaid, Children's Health Insurance Plan (CHIP), and Medicare have resulted in different outcomes in the nation's existing healthcare system (Currie & Gruber, 1996). Expansion states, therefore, anticipate that the Medicaid expansions as part of the ACA will have positive widespread health outcomes. Multiple studies assessing the early impacts of the ACA have already associated Medicaid expansion with higher rates of insurance coverage, improved quality of coverage, increased utilization of some types of health care, and higher rates of diagnosis of chronic health conditions for low-income adults (Wherry & Miller, 2017; Blavin, Karpman, Kenney, & Sommers, 2018).

While the ACA expanded coverage to about 20 million adults by 2016 (Rhodes et al., 2017), an additional estimated 4.4 million uninsured, nonelderly adults (across all non-expansion states) could become eligible for Medicaid if all states opted to expand eligibility for ACA (The Henry J. Kaiser Family Foundation [KFF], 2019). Adding previously uninsured people to the coverage pool directly raises the demand for primary health care services. The additional increase in demand could strain the primary care workforce in the long run, as physicians will have additional patients. This raises concerns about the capacity of the healthcare workforce to meet the reported increase in

demand caused by new Medicaid enrollees. Prior evidence estimates that the U.S healthcare industry will need between 4,307 and 6,940 additional primary care physicians to accommodate the increased demands created by the previously uninsured population (Hofer, Abraham, & Moscovice, 2011).

Assuming concerns about the potential increase in demand are valid, and there are no changes in the size of the primary healthcare workforce, the availability of healthcare workers may be woefully inadequate to meet demand. Therefore, it is important to examine whether healthcare providers in expansion states have developed enough capacities to compensate for the possible increases in demand for healthcare. The disparities between Medicaid expansion decisions among states provides an opportunity to assess the scope and magnitude of this problem.

Purpose of the Study

With large increases in the covered population and insurance enrollment greater than anticipated under the ACA (Frean, Gruber, & Sommers, 2016), concerns and skepticism about the availability and stability of healthcare providers continue to linger. The overall objective of this paper is to examine the effects of the 2014 Medicaid expansion on accessibility and availability of primary care in three expansion states – Illinois, Oregon, and New Jersey. The primary focus of the study is investigating how the availability of primary care has changed to meet the increased Medicaid enrollment.

This paper has a sole, central question: How have alternative state approaches to Medicaid expansion under the ACA affected primary care accessibility and availability? To answer the central question, the following specific questions are addressed:

1. Has Medicaid expansion led to increased access to primary health care for Medicaid patients?
2. Has appointment wait times changed after the implementation of the ACA's Medicaid expansion?
3. Are there gender and racial disparities in accessing primary healthcare?

Contribution

The study contributes to the growing literature on the ACA's Medicaid expansion in several ways. First, this research contributes to the ongoing debate and discussion on whether to repeal or replace the ACA by studying how Medicaid expansion has impacted the likelihood of accessing primary health care. Second, it can help to inform accessibility tailored public health interventions in the states less likely to have benefited from the ACA. The third contribution of this study is to provide a critical assessment of gender and racial disparities in accessing primary healthcare among the three expansion states of interest.

Organization

This study is organized into five chapters. The first chapter has already addressed the purpose and significance of this study. The second chapter will suggest some theoretical framework and analyze previous research on the ACA's Medicaid expansion. Chapter three outlines how the secondary data used for this study was collected and describes the statistical analysis performed. Chapter four addresses the results from the data analysis. Finally, chapter five discusses the implication of the findings, limitations of this study, and recommendations for future research.

Chapter II. LITERATURE REVIEW

There is a substantial body of literature investigating the impacts of Medicaid expansion under the ACA (Blavin, Karpman, Kenney, & Sommers, 2018; Courtemanche, Marton, Ukert, Yelowitz, & Zapata, 2016; McMorrow, Kenney, & Anderson, 2015; Wherry & Miller, 2017). There are two primary categories of relevant research: the first category of literature investigates direct impacts of Medicaid expansion, while the second literature category examines the indirect impacts.

Since Medicaid is a minimum essential health coverage program, direct impacts are all the health effects and benefits of Medicaid Expansion in terms of self-reported health, gains or reductions in coverage, utilization, access to care, and other health outcomes. Meanwhile, indirect impacts go beyond direct health effects to all the social and economic outcomes that have resulted from the ACA's Medicaid Expansions, such as impacts on migration, volunteer work, financial security and affordability of care.

Direct Health Outcomes

Significant studies on ACA's Medicaid expansion since its inception in 2010 have provided useful methods to track and assess its impacts on coverage and uninsured rates. Consistent with the ACA's objectives, numerous studies conducted right after the 2014 rollout demonstrated that states expanding Medicaid eligibility have seen large reductions in uninsured rates relative to non-expansion states (Blavin et al., 2018; Courtemanche et al., 2016; Decker & Lipton, 2017; Griffith, Evans, & Bor, 2017; Pickens et al., 2017; Selden, Lipton, & Decker, 2017; Sommers, Maylone, Blendon, Orav, & Epstein, 2017; Vistnes & Cohen, 2016; Wherry & Miller, 2017).

Over 60 percent of health insurance coverage gains in 2014 have been attributed to Medicaid expansions (Frean et al. 2016). Expansion states have experienced a larger increase in Medicaid enrollment. The rise in Medicaid enrollment is mainly as a result of enrollment for low-income adults made newly eligible for Medicaid (McMorrow, Kenney, & Anderson, 2015; Soni, Hendryx, & Simon 2017).

Further studies revealed considerable variability in Medicaid enrollment growth based on expansion and rural status. Barker, Huntzberry, McBride, & Mueller(2017) found a rapid increase in Medicaid enrollment in both expansion and non-expansion states after the passage of the ACA, with larger gains in expansion states and metropolitan areas. Likewise, Sommers, Blendon, & Orav (2016) also found increases in Medicaid enrollment after the ACA was implemented. They assert that the simplified application process and the publicity surrounding "Obamacare" has led to a "woodwork" or "welcome mat" effect by increasing Medicaid enrollment among formerly eligible but unenrolled individuals.

Literature documenting the impacts of Medicaid expansions on self-reported or self-assessed health has found mixed conclusions. Studies conducted by Simon, Soni, and Cawley (2016) on the impact of health insurance on preventive care and health behaviors confirmed the earlier findings of Sommers, Gunja, Finegold, and Musco, (2015) and concluded that Medicaid expansions improved self-reported health. Similarly, fewer patients are frequenting the Emergency Department in Maryland after state officials opted to expand Medicaid, which suggests better self-assessed health (Gingold, Pierre-Mathieu, Cole, Miller, & Khaldun, 2017). On the other hand, other research

(Courtemanche et al., 2016; Wherry & Miller, 2017) did not find significant statistical evidence that the ACA's Medicaid expansion improved self-assessed health among low-income adults in expansion states.

Other studies focused on the expansion's impacts of access to care and utilization of health care services among the low-income population. Wen, Hockenberry, Borders, and Druss, (2017) associated Medicaid expansion with reductions in cost barriers to buprenorphine[1] utilization and improved access to medication-assisted treatment of opioid use disorder. Additionally, Mahendraratnam, Dusetzina, & Farley (2017) found an increase in prescription drug utilization and reimbursement following the ACA's Medicaid expansion in 2014.

Results and conclusions from research measuring impacts on access to health services after the introduction of the ACA's Medicaid expansion are mixed. Most of these studies emphasized improved health access across a wide range of different measures among low-income residents whilst low-income individuals in non-expansion states were adversely affected (Choi, Lee, & Matejkowski, 2018; Kirby & Vistnes, 2016; Yue, Rasmussen, & Ponce, 2018; Griffith et al., 2017).

However, research by Wherry and Miller (2017) disputes these findings. They associate Medicaid expansion with longer wait times for appointments. This suggests a continuous challenge and problems in access to care. Their work conflicts with that of other studies, so further research is needed to provide a clear longer-term insight into the Medicaid expansion's impact on accessibility to health services.

[1] Per The Substance Abuse and Mental Health Administration, Buprenorphine, sold under the brand name Subutex, is used in medication-assisted treatment (MAT) to treat Opioid Use Disorder (OUD).

Many studies look at the impacts of Medicaid have largely emphasized the effects on the low-income populations in expansion and non-expansion states. However, a search of recent literature found some studies that target specific groups in both expansion and non-expansion. Specific vulnerable groups of the population which has been studied, including studies of the ACA's Medicaid expansion on early retirees, diagnosed cancer patients receiving radiation, migrants, prescription drug users, members of the lesbian, gay, bisexual, and transgender (LGBTQ) community, new patients diagnosed with a gynecologic malignancy, people with HIV, veterans, women of reproductive age, childless adults with incomes under 100% FPL and low-income parents.

Findings from these studies suggest improvement of the health of these vulnerable groups in expansion states and demonstrate missed opportunities for similar groups in non-expansion states. The uninsured rate for low income, childless adults in expansion states fell from 45.4 percent in 2013 to 16.5 percent in 2015, which represents a percentage decrease of 28.9 (McMorrow et al., 2017). A study conducted on newly diagnosed cancer patients aged 18 to 64 years who received radiation from 2011 to 2014 found a significant reduction in uninsured rates among cancer patients in Medicaid expansion states (Chino et al, 2018).

The ACA's Medicaid expansion is also responsible for expanded insurance coverage for women diagnosed with gynecologic cancer (Moss, Havrilesky, & Chino, 2017) and increased health insurance coverage for low-income women of reproductive age and women without dependent children (Johnston, Strahan, Joski, Dunlop, & Adams, 2018).

Indirect Outcomes of Medicaid Expansion

In addition to the direct health outcomes and benefits, researchers have also dedicated considerable efforts towards investigating the social and unintended consequences of the Medicaid expansion. Research suggests that Medicaid expansion decreases out of pocket spending and increases financial stability among low-income families (Mulcahy, Eibner, & Finegold, 2016; Goldman, Woolhandler, Himmelstein, Bor, & McCormick, 2018).

Wherry, Kenney, & Sommers (2016) associated Medicaid expansion among low-income children and adults with reduced out-of-pocket medical spending, reduced financial burdens, and improved material well-being for families. Consistent with these findings, Blavin et al.'s (2018) study on the effects of Medicaid expansion on coverage and out-of-pocket expenses associated low-income families in expansion states with a $344 decline in average total out-of-pocket spending.

Some studies have also found that Medicaid expansion has had positive effects on employment and the labor market in certain expansion states. Michigan's Medicaid expansion is expected to create an average of 34,082 additional jobs annually between 2015 and 2021 (Ayanian, Ehrlich, Grimes, & Levy, 2017). Leung & Mas, (2016) found no statistical significance between the recent expansions in Medicaid from the Affordable Care Act and employment opportunities.

Availability Impacts

The best existing evidence on how Medicaid expansion affects healthcare availability comes from an experimental study of state-specific Medicaid expansion

implementation and a 10-state audit study on primary care appointment availability for new Medicaid patients. The first of these is Tipirneni et al. (2015) who assessed the primary care appointment availability and wait times for new Medicaid and privately insured patients in Michigan before versus four, eight, and twelve months after the expansion. By using a before and after approach, they examined appointment availability in a stratified proportionate random sample of the previously uninsured nonelderly adult population in Michigan. They found increased appointment availability for new Medicaid patients, raising concerns on physician availability.

Rhodes et al., (2017) also explored access to primary care appointments one year after the 2014 Medicaid expansion. Using a difference-in-differences approach, they examined changes in availability across 10 states (Arkansas, Georgia, Iowa, Illinois, Massachusetts, Montana, New Jersey, Oregon, Pennsylvania, and Texas) before and after the ACA's Medicaid expansion. The research setting and participants studied in their work are much more diverse and widespread and it improves Tipirneni et al.'s work. Their analysis found an increase in Medicaid appointment rates from 57.9% in 2012 to 67.6% in 2014 (+9.7%). Differences in wait times for patients obtaining appointments before and after Medicaid expansions were not statistically significant. These conclusions are largely consistent with the findings of Tipirneni et al., (2015).

The existing literature on the impacts of Medicaid expansion on provider availability is less developed than the corresponding literature on utilization and self-reported health outcomes. This paper offers several contributions relative to previous research. Although the reviewed literature is informative, they used evidence from the

first year of Medicaid expansion and may not be relevant for 2016 and beyond. Studies from the first year of the expansions may not sufficiently depict the full effects of the reform, as the coverage will take a few years to reach complete enrollment and additional states have expanded Medicaid. With the ACA in its fifth year of full implementation, there is adequate available data to help estimate the actual impacts of expansion to access and availability. This study takes advantage of a newly available dataset on the Inter-university Consortium for Political and Social Research (ICPSR) to evaluate the impacts of expanding Medicaid through the second year.

While this study adopts a dataset similar to that of Rhodes et al, (2017), it uses a distinct set of variables and takes a different approach to analyze the dataset. Further, this study examines outcomes beyond the availability of new patient primary care appointments for Medicaid. As a secondary contribution, this study also assesses whether eligible populations in all gender and racial groups are benefiting equally from Medicaid expansion.

Several early studies on the ACA explored the immediate effect of Medicaid expansion on coverage and access to health care and related measures. Previous literature shows that the ACA's Medicaid expansion is associated with significant coverage gains and reductions in uninsured rates among those previously ineligible for Medicaid; increased utilization of health services and financial security among the low-income population. Studies indicate better self-reported health in expansions states relative to non-expansion states. Nonetheless, there are concerns over the adequacy of health

services to meet the increase in demand and the positive health outcomes following the expansion.

Chapter III. METHOD

This research uses a secondary dataset from a primary care audit study for ten states accessed via ICPSR. The data was collected through an audit methodology and compiled by (Polsky & Rhodes, 2018). Trained research assistants with phone voices that correspond to different demographic variables such as race, ethnicity, gender and age groups made phone calls to schedule the earliest appointment possible with a specified primary care physician (PCP) or any other available provider.

The simulated prospective patients were randomly assigned to an insurance type and a script demanding new-patient primary care appointments across 10 selected states in the United States. States selected for data collection include Arkansas, Georgia, Illinois, Iowa, Massachusetts, Montana, New Jersey, Oregon, Pennsylvania, and Texas. Selected states sample approximately 28.2%, 25.7%, and 29.8% of the U.S. nonelderly, Medicaid, and currently uninsured populations respectively (US Census Bureau, 2014).

Primary care offices across the 10 states were randomly sampled using a commercial database of practicing office-based physicians accessed by SK & A by IQVIA. Every sampled office needed at least one primary care physician with a specialty of general internal medicine, family medicine, or general practice and participated in at least one of the plans in a suitable insurance type. The screening was conducted to collect office-level characteristics and to identify potentially eligible offices for a pre-audit phone survey. Office-level information collected includes contact information, number of mid-level primary care physicians at every location, type of insurance accepted at the office. Some unqualified offices were later removed from the sample frame because of

ineligibility (for example permanently closed offices, offices that are otherwise unreachable or inaccessible to the general public).

Data Sample

11,192 primary care offices were randomly selected. These primary care offices were uniquely chosen according to location, insurance type accepted, and period according to the population's insurance type distribution. The dataset contains 12,919 completed phone calls for the first period, 12,848 completed calls for the second period, and 14,857 completed calls for the third period.

Phone calls were made in three different waves: November 2012 through March 2013; May 2014 through July; and February 2016 through June 2016. The mode of data collection for a before and after estimation of the impacts of the ACA's Medicaid expansion. For this analysis, the periods of data collection are defined as pre-Medicaid expansion (2012/2013), the launch of ACA (2014), and post Medicaid Expansion (2016).

The secondary dataset selected for this study has several advantages that make it useful for our analysis. First, it includes different outcome variables of interest to help estimate access and availability. There are variables to measure wait time before clinic appointments, insurance status of patients and changes in accessibility. The dataset also includes state identifiers and relevant variables on demographic characteristics (binary variables for gender, and race/ethnicity). The relatively large sample size of about 11,900 primary care offices ensures that there is a substantial sample of primary care providers affected by the recent Medicaid expansions under the ACA.

Variables Used for Analysis

Access Variable

This study measures accessibility to primary healthcare in terms of the likelihood of patients having high or low accessibility in the post-Medicaid expansion period. The dataset includes a variable (APPTDISP) that represents the results of every attempt at an appointment. This variable asks, "What is the final disposition of this case?" and responses are given as follows;

1. Can't be seen here.
2. Regular appointment.
3. Hypothetical appointment date.
4. Vague appointment availability.
5. Walk-in only.
6. Can't get past appointment system restrictions.

The "APPTDISP" variable was recoded as ACCESS to reflect desired levels of accessibility. Responses 2, 3, 4, and 5 (recoded as 1) are considered high accessibility to primary healthcare. Patients with vague and hypothetical appointment dispositions may still see primary care providers albeit later than patients with regular appointments and walk-ins. Responses 1 and 6 (recoded as 0) are considered low accessibility. These patients did not receive appointments with their primary care providers and may have to seek other alternatives. The ACCESS variable serves as the main dependent variable for the analysis.

Availability Variable

The variable wait period before every appointment (DAYSTOAPPT) is used to estimate changes in how readily available primary care physicians are to seeing patients. This variable represents the fixed wait time, measured in days, between securing an appointment and the actual expected date of visiting the clinic. This variable also serves as a measure of how adequately providers are meeting the demand for primary care.

Insurance Types

Another important variable for this analysis is the INS variable. The INS variable represents the insurance status of patients and is categorized as follows;

1. Commercial
2. Public
3. None
4. HIX
5. Small HIX

1,2,3 are patients with private insurance, Medicaid insurance, and no insurance respectively. HIX and small HIX represent patients with insurance purchased through the ACA's health exchanges or health insurance marketplaces. HIX (4) and Small HIX (5) were excluded from the analysis as enrollment in the marketplaces only started after the ACA's enactment and would not allow for a pre and post-Medicaid expansion comparison. Indicator variables defined as INS_COM, INS_PUB, and INS_NONE were generated to represent commercial, public and no insurance respectively. In analyzing the dataset, the different observations were sorted according to the different insurance status of patients to allow for easier comparison.

State Variable

States were grouped in the STATEDUMMY variable according to the timing and the approach they took to expanding Medicaid. Arkansas, Iowa, Illinois, Massachusetts, New Jersey, and Oregon are broadly grouped as expansion states since all these states opted to expand Medicaid in 2014. On the other hand, Georgia, Montana, Pennsylvania, and Texas had not expanded Medicaid during the final wave of collecting the data and are therefore grouped as non-expansion states.

Unlike Rhodes., et al (2017), this study excluded Massachusetts from the analysis because the state expanded Medicaid eligibility for MassHealth (its Medicaid program) through a statewide health reform initiative in 2006. Before the ACA was implemented in 2014, Massachusetts had already broadened Medicaid coverage to children in families with income up to 300 percent of the FPL. Among other guidelines, Massachusetts' 2006 reform initiative was based on expanding its Medicaid program, creating a new subsidized program through a health insurance exchange, establishing insurance market reforms to make insurance more affordable, and mandating employers not offering insurance to help finance government subsidies (Doonan & Tull, 2010).Including Massachusetts could skew the results since they had already expanded Medicaid before the ACA was introduced.

Additionally, Arkansas and Iowa were excluded from the final dataset as they are two of the eight states currently implementing Medicaid expansion through a Center for Medicare and Medicaid Services (CMS) Section 1115 Waiver. As the study is only interested in states that expanded Medicaid via the traditional method, the two were

removed. Arkansas and Iowa are utilizing premium assistance to obtain private health coverage, which is accessed through newly formed individual health insurance marketplace to individuals with incomes between 100 and 138 percent of the FPL.

For the group of non-expansion states, Pennsylvania was dropped as they opted to expand Medicaid during the third wave of data collection (2016). The final dataset for the analysis classifies 3 states (Illinois, New Jersey, and Oregon) that expanded Medicaid traditionally under the guidelines of the ACA as the treatment group. Georgia, Montana, and Texas are classified as the control group. Montana expanded Medicaid after the third wave of data collection, however, the timing of their expansion makes them desirable for the group of non-expansion states. In analyzing the dataset, a binary variable (STATEDUMMY) was created to represent all expansion and non-expansion states. The STATEDUMMY variable equals 1 when a patient lives in a treatment state and equals 0 if the respondent lives in a control state.

Other important independent variables used for this analysis include binary variables for gender and race of patients. Black_PT, WHITE_PT, HISPANIC_PT were created to represent African American, White, and Latino or Hispanic patients respectively. There is also a binary variable (FEMALE) for female patients.

Statistical Analysis Strategies

This research compares differences in primary care accessibility and availability between Medicaid patients in expansion and non-expansion states before and after the ACA's Medicaid expansion was introduced. To analyze the dataset, observations under the insurance variable (INS) was subdivided into two types of insurance coverage -

commercial and public insurance across the two study periods. Medicaid expansion under the ACA predominantly affects Medicaid and uninsured patients. Therefore, within the treatment group, changes in accessibility are expected to be highly significant for Medicaid and uninsured patients and less significant, if any, for patients with private insurance.

Statistical Methods

To examine the differences in levels of accessibility between the treatment and control groups, two hypotheses were tested. For the treatment group (i.e. expansion states), the first hypothesis is stated as, Patients will have significantly higher access to primary healthcare, which is expressed as:

1. $H_0 : \mu_1 \leq \mu_2$

   $H_1 : \mu_1 > \mu_2$

For the control group (i.e. non-expansion states), the hypothesis is stated as, the Patients will have significantly lower access to primary care, which is also expressed as:

2. $H_0 : \mu_1 \geq \mu_2$

   $H_1 : \mu_1 < \mu_2$

For analyzing gender and racial disparities in primary healthcare delivery, three additional hypotheses were tested. Firstly, male and female patients have an equal likelihood of having higher access to healthcare, which is expressed as

3. $H_0 : \mu_1 = \mu_2$

   $H_1 : \mu_1 \neq \mu_2$

The fourth and fifth hypotheses are stated as white patients' have significantly higher access to primary healthcare, and African American patients will have lower access to primary care respectively, which were expressed as:

4. $H_0 : \mu_1 \leq \mu_2$

   $H_1 : \mu_1 > \mu_2$ and;

5. $H_0 : \mu_1 \geq \mu_2$

   $H_1 : \mu_1 < \mu_2$

Multivariable logistic models were used to estimate changes in the likelihood of having higher access to primary healthcare associated with Medicaid expansion. Logistic regression models initially constructed estimates change in the likelihood of having higher access to healthcare across treatment and control groups. The following equation was used in assessing preexisting and current trends in accessing primary health care:

6. $L_i = In\left[\frac{Pi}{1-Pi}\right] = b_0 + b_1 x_i + e_i$

Where:

Pi is the probability;

b_0 and b_1 are the parameters;

x_i is the value of statedummy variable, and

e_i is the value of the random error term.

Initial models estimate coefficients for state variables only. However, gender and race variables are added to subsequent models as independent (control) variables to examine their moderating effects. The estimated models adjusted for race and ethnic backgrounds take the following form:

$$7.\quad L_i = In\left[\frac{Pi}{1-Pi}\right] = b_0 + b_1 x_i + b_2 x_2 + b_3 x_3 + b_4 x_4 + e_i$$

Where:

Pi: is the probability;

b_0, b_1, b_2, b_3, and b_4: are the parameters;

x_i: is the value of statedummy variable;

x_2 and x_3: are values of the race variable; x_4 is the value of the gender variable; and

e_i: is the value of the random error term.

As a final step, this study investigated corresponding changes in provider supply of healthcare by analyzing mean wait times for doctor appointments across pre-Medicaid and post Medicaid Expansion periods. To estimate provider response to the increase in coverage, mean wait times for patients with public health insurance were compared to the wait times for those with private health insurance. Further investigations were also conducted on the number and various kinds of primary care providers available at different locations before and after expansion periods.

All logistic regression models and statistical analyses for this study were conducted in Gnu Regression, Econometrics and Time-series Library (Gretl) version 2019a released 2019-01-24. The charts and graphs were generated with Microsoft Excel 2016. Unless otherwise specified, the ACCESS variable is used as the dependent variable in all logistic regression models. (*Selected supplementary details on the logit models and estimation methods are provided in the Appendix).*

Chapter IV. RESULTS

This chapter presents the results from the analysis and discusses findings from the primary care audit dataset obtained from ICPSR. Of the 6 states included in the analysis, 3 implemented Medicaid expansion on January 1, 2014, and had a full 2 years of post-implementation data available; the remaining 3 states opted out of the ACA's Medicaid expansion.

After excluding observations made in Arkansas, Pennsylvania, Massachusetts, and Iowa the sample size was 7,246 for both treatment and control groups in the pre-expansion period. Conversely, the sample size for both treatment and control groups during the post-expansion period was 8,228. Table I shows the demographic characteristics of patients in treatment (i.e. expansion states) and control (i.e. non-expansion) groups.

The analysis focused on pre and post Medicaid expansion periods, hence all observations made in 2014 were dropped. The number of patients who sought primary healthcare within the treatment group in the pre-expansion period was 3954. On the other hand, 3292 patients sought primary healthcare in the control group during the post-expansion period. In the post-expansion period, 4636 and 3702 patients sought primary healthcare in treatment and control groups respectively. For the pre-Medicaid expansion dataset, patients in the treatment group were more likely to be African American (38.92%), and less likely to be female (49.82% to 50.18% male). Patients in the control group were more likely to be female 51.12% and more likely to be African Americans.

TABLE I.

Characteristics Of Prospective Patients Seeking Appointments At Primary Care Centers

Pre-Medicaid Expansion		
	Treatment Group	*Control Group*
	N = 3954	N=3292
Characteristic		
Caller Race		
African American	1539	1224
Latino/Hispanic	920	766
White	1495	1302
Caller Gender		
Female	1970	1683

Post-Medicaid Expansion		
	Treatment Group	*Control Group*
	N=4636	N=3702
Characteristic		
Caller Race		
African American	1982	1676
Latino/Hispanic	950	749
White	1704	1278
Caller Gender		
Female	2589	2128

In the post-Medicaid expansion period, patients in the treatment group were more likely to be African American (42.75%), and more likely to be female (55.85%). Conversely, patients in the control group are less likely to be male and more likely to be

African American (45.27%). Table I enhances understanding of the dataset and it helped contextualize findings and the formulation of suitable recommendations.

Impacts on Accessibility

First, accessibility impacts were reviewed. The hypothesis was that Medicaid patients within the treatment group will have significantly higher access to primary healthcare in the post-expansion period. Table II reports results from logistic regression output for changes in accessibility to primary care among patients with public insurance coverage. The first section of the table gives the coefficient estimates, standard errors, and z scores for the STATEDUMMY variable in the pre-Medicaid expansion period. The second section of the table also presents the relative coefficient estimates, standard errors, and z scores for the same variable in post-Medicaid expansion periods. An indicator of statistical significance (at 5% level) is also featured in the last column of both sections.

Table II.

Accessibility To Primary Care Among Medicaid Patients Before And After Medicaid Expansion.

Pre-Medicaid Expansion				
Number of observations: 2771				
	Coefficient	*Std. Error*	*z*	*p-value*
const	0.6505	0.0603	10.7900	<0.0001
STATEDUMMY	−0.4288	0.0790	−5.426	<0.0001
Post-Medicaid Expansion				
Number of observations: 2432				
	Coefficient	*Std. Error*	*z*	*p-value*
const	0.6699	0.0639	10.4800	<0.0001
STATEDUMMY	0.0514	0.0865	0.5941	0.5524

Results from Table II suggest that patients with public insurance coverage in treatment and control states saw different trends in accessing healthcare before the implementation of the ACA. P-value of <0.0001 gives enough evidence to conclude that a significant difference existed between treatment and control groups. In the pre-expansion era, Medicaid patients in expansion states were less likely to have higher access to primary healthcare. In the post-expansion era, the STATEDUMMY was not statistically significant at 1%; 5% and 10%. The p-value did not give enough evidence to accept or reject the hypothesis that Patients in Medicaid expansion states will have significantly higher access to primary healthcare.

Table III compares coefficients and p-value estimates for privately insured patients in treatment and control groups during pre and post Medicaid expansion periods. The P-value is statistically significant in the pre-expansion period, suggesting that individuals in the treatment group were less likely to have high access to primary healthcare.

Table III.

Accessibility To Primary Care Among Patients With Private Insurance Coverage Before And After Medicaid Expansion

Pre-Medicaid Expansion				
Number of observations: 3388				
	Coefficient	*Std. Error*	*z*	*p-value*
const	2.0071	0.0792	25.350	<0.0001
STATEDUMMY	−0.2427	0.1028	−2.360	0.0183
Post Medicaid Expansion				
Number of observations: 2634				
	Coefficient	*Std. Error*	*z*	*p-value*
const	1.75786	0.0843	20.850	<0.0001
STATEDUMMY	−0.344895	0.1063	−3.244	0.0012

Likewise, the p-value in post-expansion is still statistically significant, with individuals in treatment groups having a lesser probability of accessing primary health care.

Gender and Racial Disparity

Additionally, gender and racial disparities in accessing healthcare were reviewed. Table IV shows the logistic regression output for changes in the likelihood of access for different gender and racial groups in the aftermath of Medicaid expansion.

Table IV.

Disparities In Accessing Healthcare Among Patients With Different Demographic Characteristics.

Public Insurance Coverage				
Number of observations: 2432				
	Coefficient	*Std. Error*	*z*	*p-value*
const	0.8673	0.1178	7.3650	<0.0001
STATEDUMMY	0.0398	0.0867	0.4583	0.6467
WHITE_PT	−0.0734922	0.1225	−0.6001	0.5485
BLACK_PT	−0.104201	0.1198	−0.8695	0.3846
FEMALE	−0.201738	0.0910	−2.216	0.0267
Private Insurance Coverage				
Number of observations: 2634				
	Coefficient	*Std. Error*	*z*	*p-value*
const	1.43667	0.133137	10.79	<0.0001
STATEDUMMY	−0.345854	0.106761	−3.240	0.0012
WHITE_PT	0.623128	0.140573	4.433	<0.0001
BLACK_PT	0.331462	0.132642	2.499	0.0125
FEMALE	−0.0509895	0.109158	−0.4671	0.6404

The upper section of Table IV gives the coefficient estimates, standard errors, and z scores for the state (STATEDUMMY), ethnic (BLACK_PT and WHITE_PT), and gender (FEMALE) variables in post-Medicaid expansion period.

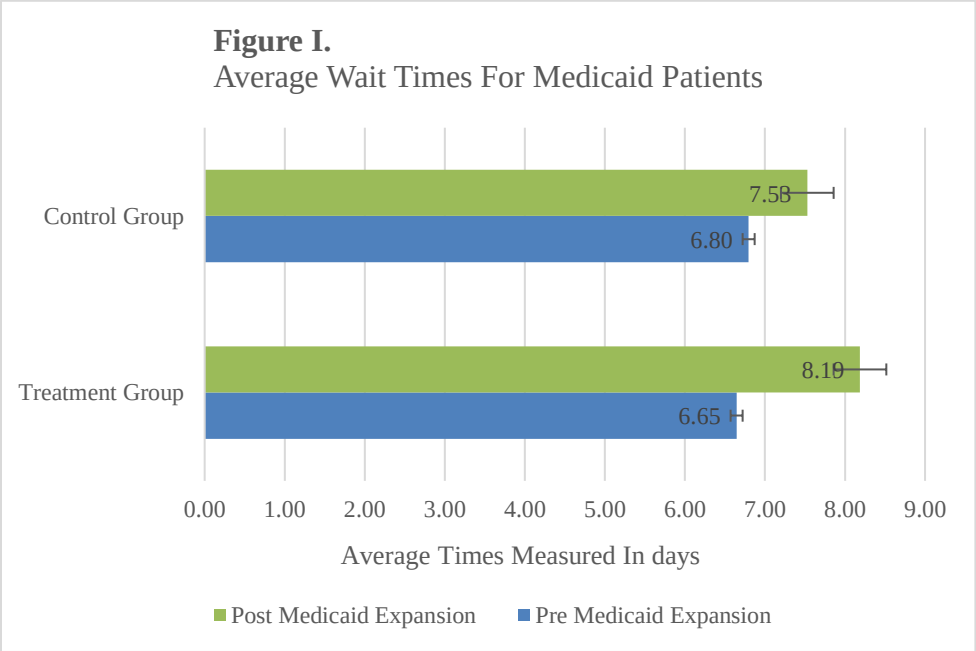
P-value is 0.0267 for the FEMALE variable which suggests that female Medicaid patients have a lesser likelihood of having higher accessibility to healthcare. At 5%, there is enough evidence to reject the hypothesis that male and female patients have an equal likelihood of accessing primary healthcare. Among patients with private insurance, there is no statistically significant relationship between a patient's gender and the level of primary health care he or she is likely to access.

P values for WHITE_PT and BLACK_PT variables for private insurance are not statistically significant at 5%. The P-values for White and African American patients are 0.5485 and 0.3846 respectively. P-values of the racial variables is not enough evidence to reject the hypothesis that the race of a patient is associated with his or her level of accessing primary healthcare. Among treatment and control groups, privately insured white patients have the highest likelihood of accessing primary healthcare.

Availability of Primary Health Services.

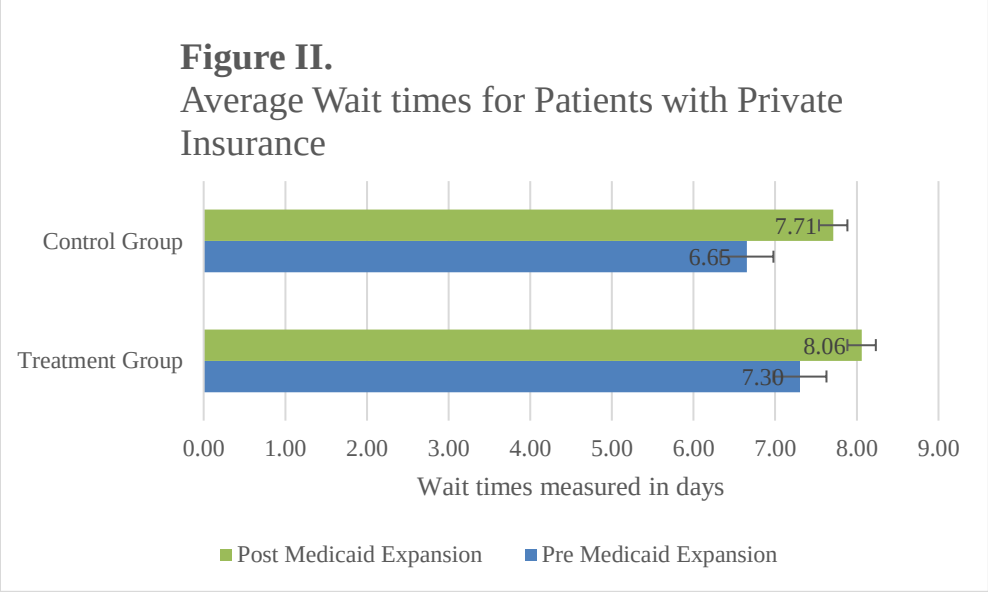
To investigate a provider's response to demand increases, the study estimated changes in mean wait times before appointments for patients with Medicaid and private coverage in pre and post-expansion periods. Figures I and II show the average estimated wait times, in days, for callers with public and private health insurance respectively.

Results from Figure I shows a general increase in the number of days before an appointment for Medicaid patients in both the control and treatment groups. Wait times increased in expansion and non-expansion states.



Before the introduction of the ACA, the waiting period averaged 6 days for Medicaid callers. However, after the ACA was introduced, this number increased to about 7 days (10.78% increase) in non-expansion states and about 8 days (23.16% increase) in expansion states.

Figure II demonstrates a similar increase in the mean wait time for callers with private insurance between pre-Medicaid expansion and post-Medicaid expansion periods. Appointment wait times increased from 7 to 8 days (10.34% increase) for callers in expansion states whilst appointment wait times increased from 6 to 7 (15.88% increase) days for callers in non-expansion states.



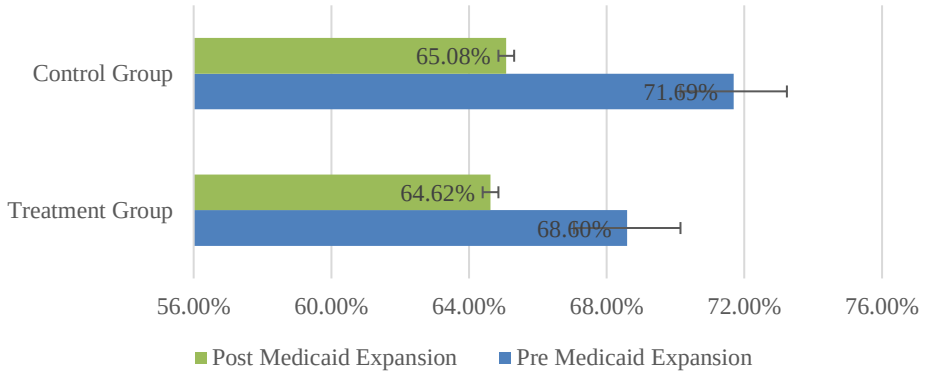
Both charts indicate that the implementation of the ACA's Medicaid expansion has led to longer wait times for primary care appointments for patients in both expansion and non-expansion states. However, compared to non-expansion states, wait times in expansion states are significantly higher for patients. Medicaid patients in expansion states saw the greatest increase in average wait time. Health care is a high demand service, which is highly sought after once accessibility barriers are removed, resulting in longer wait times.

Availability of physician and non-physician providers.

The final part of the analysis included an examination of the proportion of appointments scheduled with primary care physicians versus mid-level providers. Generally, the number of physician and non-physician providers increased during the post-Medicaid period, with the treatment group seeing the larger increase. Provider availability increased by 5.39% and 17.24% for the control and treatment groups

respectively. Figure III presents results for the proportion of appointments scheduled with physician providers before and after Medicaid expansion.

Figure III.
Primary Care Physicians Availability Before And After Mediciad Expansion



Before the ACA was introduced, 68.60% of appointments by Medicaid patients in expansion states were scheduled with primary care physicians. However, the results show that primary care physician availability decreased to 64.62% in the aftermath of Medicaid expansion. This could be a reason why the average wait time increased from 6 to 8 days for Medicaid patients. For patients within non-expansion states, 71.69% of appointments were scheduled with physician providers in the pre-Medicaid expansion period, which decreased to 65.08% in the post-expansion period.

Figure IV shows the results for the proportion of appointments scheduled with non-physician providers before and after Medicaid expansion. The proportion of appointments scheduled with mid-level providers in expansion states increased from 3.84% in the pre-expansion period to 7.83% in the post-expansion period for Medicaid patients. For patients in non-expansion states, 7.14% were scheduled with mid-level

providers in the pre-Medicaid expansion period which increased to 8.78% in the post-expansion period.

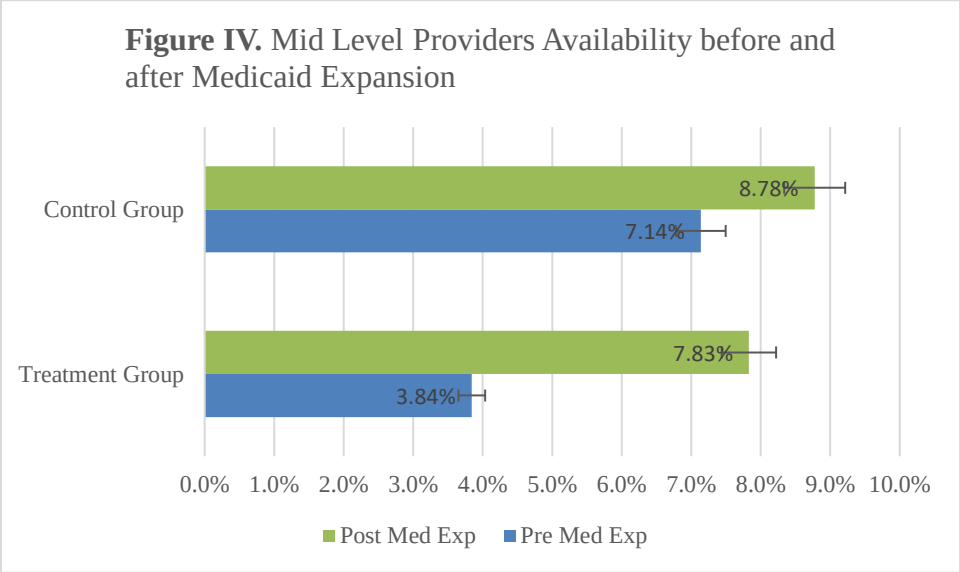


Figure IV. Mid Level Providers Availability before and after Medicaid Expansion

Generally, primary care physician availability decreased in the aftermath of the ACA's Medicaid expansion with non-expansion states seeing the largest decrease. On the other hand, mid-level providers are accepting more appointments in the post-Medicaid expansion period. The proportion of appointments scheduled with mid-level providers increased across the six states studied with patients in expansion states seeing the largest increase.

Chapter V. DISCUSSION

Discussion

Significant improvements in self-reported health and gains insurance coverage as a result of the ACA have been widely documented. This study builds on prior research by investigating how Medicaid expansion under the ACA has impacted accessibility to healthcare and the supply of primary health care. The study focuses on Medicaid patients in 3 opt-in states (Illinois, New Jersey, and Oregon) and 3 opt-out states (Georgia, Montana, and Texas).

In contrast to previous studies by Sommers et al. (2015) and Simon, Soni, and Cawley (2016), this study found that there is not a significant difference in the likelihood of accessing healthcare among Medicaid patients in the six states studied. The study did not find enough statistical significance to conclude that compared to patients in non-expansion, Medicaid patients in expansion states are better off in terms of accessibility to primary care.

Compared to preexisting levels of access, the current level of access for Medicaid patients in expansion states may have improved as a result of the ACA's Medicaid expansion. Per the logistic regression analysis (Table II), Medicaid patients were less likely to have higher access to primary healthcare before Medicaid expansion. The finding of no statistical significance between expansion status and accessibility in the post-expansion era may in some cases prove that Medicaid patient accessibility is not worsening.

While there was not a statistical significance between Medicaid expansion and the likelihood of accessing primary healthcare, the subgroup analyses demonstrated that there was an increase in wait times after the Medicaid expansion in both expansion and non-expansion states. The number of calendar days between the date of a patient's call and the date of the patient's appointment increased from 6 to 7 for Medicaid patients in non-expansion states and 6 to 8 for Medicaid patients in expansion states. The increase in wait times is not particularly surprising given the reported influx of new Medicaid enrollees.

Additionally, this research found issues in provider availability in the post-expansion period. These results show that primary care providers have responded to the growing patient demand by using more mid-level providers. Physician availability in expansion and non-expansion decreased substantially between 2012 and 2016. In the post-expansion era, physician availability decreased by 10.16% in non-expansion states and by 6.16% in expansion states. The decrease in physician availability may be attributed to challenges physicians are experiencing with adapting to the increase in primary care demand as a result of the ACA's Medicaid expansion. It is also possible that some primary care providers are reluctant to accept newly insured Medicaid patients due to low reimbursement rates.

While this study saw a decrease in provider availability, the proportion of primary care appointments made with mid-level providers (physician assistants and nurse practitioners and social workers) increased in the aftermath of Medicaid expansion. The increase in mid-level practitioners was highly significant in expansion states. In expansion states, appointments scheduled with mid-level practitioners increased by 104%

between 2012 and 2016. This shows that the role of mid-level providers in delivering primary care has increased during the post-expansion period. Providers are addressing growing patient demand by increasing mid-level practitioner involvement in primary healthcare delivery.

Finally, this study found no statistical significance between a patient's likelihood of accessing primary healthcare and the patient's race. Providers scheduled appointments without consideration of the race and ethnicity of Medicaid patients. White, African American and Latino or Hispanic patients may have an equal probability of accessing primary healthcare.

The gender differential, however, affected the likelihood of higher access to primary healthcare. Male and female Medicaid patients do not have an equal likelihood of accessing primary healthcare. Low-income, female Medicaid patients have a lower probability of accessing primary health care relative to male Medicaid patients.

Policy Implications

As policymakers, particularly those in non-expansion states, continue to debate whether to expand Medicaid eligibility, it is important to look beyond the reported decrease in uninsured rates and holistically examine the impacts of Medicaid expansion. It is important to examine how patients are benefiting from Medicaid in terms of health outcomes such as accessibility, availability, and utilization.

Average wait time before seeing providers has increased two years following the ACA's expansion of Medicaid which may justify prior concerns about the adequacy of the primary care workforce to meet increases in demand. There is an increasing

proportion of appointments scheduled with midlevel providers in the post-expansion period. This presents an opportunity to further expand the role of mid-level or non-physician providers to help alleviate capacity constraints in delivering healthcare. Policies geared towards helping to train and employ more mid-level practitioners could help providers, particularly those in expansion states, to better serve the health needs of new Medicaid patients. Policymakers should explore team-based initiatives to help address the reduction in physician availability.

Further, there are gender disparities in accessing primary healthcare among Medicaid patients. There is a need for policies geared towards bridging gender gaps and eliminating barriers female Medicaid patients face in accessing healthcare. Regulatory measures at the state level and organizational approaches may help enhance gender equity in healthcare delivery.

Limitations

This study has limitations that warrant some caution in the interpretation of results. First, the study uses data collected by simulated patients. Whiles using simulated patients offer flexibility and cost-saving advantages, it may not provide all the data needed to adequately estimate all parameters. These simulated patients used for collecting the data for this study may lack the clinical record and history of a real patient that could have otherwise facilitate the scheduling of appointments.

The second limitation lies in the short, 2-year post-expansion period studied. As a result of data availability, this study is unable to assess effects beyond the period that the ICPSR data was collected. Stakeholders, in this case, primary care providers, state

government, patients, insurance companies and pharmaceutical firms may need more than two years to fully adapt to such a major amendment to the healthcare system.

Finally, this paper only studied patients in six states. As such, conclusions may not be generalizable to all 50 states. There are significant socio-economic and physical factors that could affect the importance of these findings for patients and policymakers in other states.

Recommendations for Future Research

While this study could not establish statistical significance between Medicaid expansion and the probability of accessing primary healthcare, it is important to continue exploring the impacts of Medicaid expansion under the ACA. To help understand the long-term impacts of Medicaid expansion, future research should continue to explore the effects of ACA Medicaid expansions on accessibility as more post-expansion data become available. To fully evaluate the impact of the ACA, future studies should also assess the impacts of the other provisions of the ACA such as the marketplace's lifetime limits, pre-existing condition protection, and tax credits.

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APPENDIX

Supplement to: The Impact of Medicaid Expansion under the Affordable Care Act on Accessibility and Availability of Primary Health Care.

Appendix Table 1: Full List Of Medicaid Expansion And Non-Expansion States.

Expansion States	
Alaska	Minnesota
Arizona	Montana
Arkansas	Nebraska*
California	Nevada
Colorado	New Hampshire
Connecticut	New Jersey
Delaware	New Mexico
District of Columbia	New York
Hawaii	North Dakota
Idaho*	Ohio
Illinois	Oregon
Indiana	Pennsylvania
Iowa	Rhode Island
Kentucky	Utah*
Louisiana	Virginia
Maine	Vermont
Maryland	Washington
Massachusetts	West Virginia
Michigan	

Non-expansion states	
Alabama	Oklahoma
Florida	South Carolina
Georgia	South Dakota
Kansas	Tennessee
Mississippi	Texas
Missouri	Wisconsin
North Carolina	Wyoming

**Expanded but are yet to implement.*

Appendix Table 2: Summary Statistics for Patients with Public Insurance within Treatment Group, 2012

Observations 1 – 694 (outliers dropped), variable: Mean wait time **(DAYSTOAPPT)**

Pre-Medicaid Expansion

Mean	Median	Minimum	Maximum
6.6455	4.0000	0.0000	27.000
Std. Dev.	C.V.	Skewness	Ex. kurtosis
6.4554	0.97139	1.3054	0.98547
5% Perc.	95% Perc.	IQ range	Missing obs.
0.0000	21.000	7.0000	0

Appendix Table 3: Summary Statistics for Patients with Public Insurance within Control Group, 2012

Observations 1 – 681 (outliers dropped), variable: Mean wait time **(DAYSTOAPPT)**

Pre Medicaid Expansion

Mean	Median	Minimum	Maximum
6.7959	5.0000	0.0000	31.000
Std. Dev.	C.V.	Skewness	Ex. kurtosis
6.9860	1.0280	1.4069	1.3364
5% Perc.	95% Perc.	IQ range	Missing obs.
0.0000	22.000	8.0000	0

Appendix Table 4: Summary Statistics for Patients with Public Insurance within Treatment Group, 2016

Observations 1 – 674 (outliers dropped), variable: Mean wait time (DAYSTOAPPT)

Post Medicaid Expansion

Mean	Median	Minimum	Maximum
8.1869	6.0000	0.0000	30.000
Std. Dev.	C.V.	Skewness	Ex. kurtosis
7.0241	0.85796	1.1813	0.78294
5% Perc.	95% Perc.	IQ range	Missing obs.
1.0000	24.000	9.0000	0

Appendix Table 5: Summary Statistics for Patients with Public Insurance within Control Group, 2016

Observations 1 – 577 (outliers dropped), variable: Mean wait time (DAYSTOAPPT)

Post Medicaid Expansion

Mean	Median	Minimum	Maximum
7.5286	5.0000	0.0000	30.000
Std. Dev.	C.V.	Skewness	Ex. kurtosis
7.0057	0.93054	1.3141	1.1234
5% Perc.	95% Perc.	IQ range	Missing obs.
1.0000	23.000	8.5000	0

Appendix Table 6: Summary Statistics for Patients with Private Insurance within Treatment Group, 2012

Observations 1 – 1384 (outliers dropped), variable: Mean wait time DAYSTOAPPT

Pre Medicaid Expansion

Mean	Median	Minimum	Maximum
7.3035	5.0000	0.0000	29.000
Std. Dev.	C.V.	Skewness	Ex. kurtosis
6.7918	0.92995	1.1968	0.71049
5% Perc.	95% Perc.	IQ range	Missing obs.
0.0000	21.000	9.0000	0

Appendix Table 7: Summary Statistics for Patients with Private Insurance within Control Group, 2012

Observations 1 – 1179 (outliers dropped), variable: mean wait time DAYSTOAPPT

Pre Medicaid Expansion

Mean	Median	Minimum	Maximum
6.6539	5.0000	0.0000	27.000
Std. Dev.	C.V.	Skewness	Ex. kurtosis
6.2222	0.93511	1.2536	0.91618
5% Perc.	95% Perc.	IQ range	Missing obs.
0.0000	20.000	7.0000	0

Appendix Table 8: Summary Statistics Summary Statistics for Patients with Private Insurance within Treatment Group, 2016

Observations 1 – 971 (outliers dropped), variable: Mean wait time **(DAYSTOAPPT)**

Post Medicaid Expansion

Mean	Median	Minimum	Maximum
8.0587	6.0000	0.0000	30.000
Std. Dev.	C.V.	Skewness	Ex. kurtosis
7.2520	0.89990	1.2465	0.78529
5% Perc.	95% Perc.	IQ range	Missing obs.
1.0000	25.000	9.0000	0

Appendix Table 9: Summary Statistics Summary Statistics for Patients with Private Insurance within Control Group, 2016

Observations 1 – 774 (outliers dropped), variable: Mean wait time DAYSTOAPPT

Post Medicaid Expansion

Mean	Median	Minimum	Maximum
7.7106	6.0000	0.0000	30.000
Std. Dev.	C.V.	Skewness	Ex. kurtosis
7.0153	0.90983	1.2950	1.1209
5% Perc.	95% Perc.	IQ range	Missing obs.
1.0000	24.000	9.0000	0

Appendix Model 1: Logit Regression Model, Public Insurance 2012, p-value

Using observations 1-2771, Dependent variable: ACCESS

Standard errors based on Hessian

	Coefficient	*Std. Error*	*z*	*p-value*	
const	0.650484	0.0602658	10.79	<0.0001	***
STATEDUMMY	−0.428793	0.0790325	−5.426	<0.0001	***

Mean dependent var	0.600144	S.D. dependent var	0.489957
McFadden R-squared	0.007973	Adjusted R-squared	0.006901
Log-likelihood	−1849.885	Akaike criterion	3703.769
Schwarz criterion	3715.623	Hannan-Quinn	3708.050

Number of cases 'correctly predicted' = 1663 (60.0%)

f(beta'x) at mean of independent vars = 0.490

Likelihood ratio test: Chi-square(1) = 29.7368 [0.0000]

Appendix Model 2: Logit Regression Model, Public Insurance 2012 with gender and race variables.

Using observations 1-2771, Dependent variable: ACCESS

Standard errors based on Hessian

	Coefficient	*Std. Error*	*z*	*p-value*	
const	0.414405	0.0989684	4.187	<0.0001	***
STATEDUMMY	−0.420545	0.0792923	−5.304	<0.0001	***
WHITE_PT	0.331816	0.102823	3.227	0.0013	***
BLACK_PT	0.0539438	0.101704	0.5304	0.5958	
FEMALE	0.177106	0.0793601	2.232	0.0256	**

Mean dependent var	0.600144	S.D. dependent var	0.489957
McFadden R-squared	0.012568	Adjusted R-squared	0.009887
Log-likelihood	−1841.316	Akaike criterion	3692.632
Schwarz criterion	3722.267	Hannan-Quinn	3703.335

Number of cases 'correctly predicted' = 1685 (60.8%)

f(beta'x) at mean of independent vars = 0.490

Likelihood ratio test: Chi-square(4) = 46.8741 [0.0000]

Appendix Model 3: Logit Regression Model Private Insurance 2012

Using observations 1-3388, Dependent variable: ACCESS

Standard errors based on Hessian

	Coefficient	*Std. Error*	*z*	*p-value*	
const	2.00714	0.0791660	25.35	<0.0001	***
STATEDUMMY	−0.242710	0.102827	−2.360	0.0183	**

Mean dependent var	0.866293	S.D. dependent var	0.340388
McFadden R-squared	0.002112	Adjusted R-squared	0.000612
Log-likelihood	−1329.935	Akaike criterion	2663.869
Schwarz criterion	2676.125	Hannan-Quinn	2668.250

Number of cases 'correctly predicted' = 2935 (86.6%)
f(beta'x) at mean of independent vars = 0.340
Likelihood ratio test: Chi-square(1) = 5.63081 [0.0176]

*Evaluated at the mean
Number of cases 'correctly predicted' = 1624 (66.8%)
f(beta'x) at mean of independent vars = 0.471
Likelihood ratio test: Chi-square(4) = 7.34864 [0.1186]

Appendix Model 4, Logit Regression Model, Private Insurance 2012 with gender and race variables.

using observations 1-3388, Dependent variable: ACCESS

Standard errors based on Hessian

	Coefficient	*Std. Error*	*z*	*p-value*	
const	2.08210	0.134837	15.44	<0.0001	***
STATEDUMMY	−0.238446	0.102934	−2.317	0.0205	**
WHITE_PT	−0.136492	0.137006	−0.9962	0.3191	
BLACK_PT	−0.242624	0.137597	−1.763	0.0779	*
FEMALE	0.140501	0.101653	1.382	0.1669	

Mean dependent var	0.866293	S.D. dependent var	0.340388
McFadden R-squared	0.003891	Adjusted R-squared	0.000139
Log-likelihood	−1327.564	Akaike criterion	2665.129
Schwarz criterion	2695.769	Hannan-Quinn	2676.082

Number of cases 'correctly predicted' = 2935 (86.6%)
f(beta'x) at mean of independent vars = 0.340
Likelihood ratio test: Chi-square(4) = 10.3714 [0.0346]

Appendix Model 5, Logit Regression Model, Public Insurance 2016

Using observations 1-2432Dependent variable: ACCESS
Standard errors based on Hessian

	Coefficient	*Std. Error*	*z*	*p-value*	
const	0.669906	0.0639205	10.48	<0.0001	***
STATEDUMMY	0.0513801	0.0864801	0.5941	0.5524	

Mean dependent var	0.667763	S.D. dependent var	0.471112
McFadden R-squared	0.000114	Adjusted R-squared	-0.001179
Log-likelihood	−1545.971	Akaike criterion	3095.942
Schwarz criterion	3107.535	Hannan-Quinn	3100.157

Number of cases 'correctly predicted' = 1624 (66.8%)
f(beta'x) at mean of independent vars = 0.471
Likelihood ratio test: Chi-square(1) = 0.352821 [0.5525]

Appendix Model 6: Logit Regression Model, Public Insurance 2016 with race and gender variables.

Using observations 1-2432, Dependent variable: ACCESS
Standard errors based on Hessian

	Coefficient	*Std. Error*	*z*	*p-value*	
const	0.867253	0.117759	7.365	<0.0001	***
STATEDUMMY	0.0397531	0.0867339	0.4583	0.6467	
WHITE_PT	−0.0734922	0.122473	−0.6001	0.5485	
BLACK_PT	−0.104201	0.119836	−0.8695	0.3846	
FEMALE	−0.201738	0.0910337	−2.216	0.0267	**

Mean dependent var	0.667763	S.D. dependent var	0.471112
McFadden R-squared	0.002376	Adjusted R-squared	-0.000857
Log-likelihood	−1542.473	Akaike criterion	3094.946
Schwarz criterion	3123.929	Hannan-Quinn	3105.483

Number of cases 'correctly predicted' = 1624 (66.8%)
f(beta'x) at mean of independent vars = 0.471
Likelihood ratio test: Chi-square(4) = 7.34864 [0.1186]

Appendix Model 7: Logit Regression Model Private Insurance 2016

Using observations 1-2634, Dependent variable: ACCESS
Standard errors based on Hessian

	Coefficient	*Std. Error*	*z*	*p-value*	
const	1.75786	0.0842944	20.85	<0.0001	***
STATEDUMMY	−0.344895	0.106331	−3.244	0.0012	***

Mean dependent var	0.824981	S.D. dependent var	0.380055
McFadden R-squared	0.004392	Adjusted R-squared	0.002755
Log-likelihood	−1216.168	Akaike criterion	2436.336
Schwarz criterion	2448.089	Hannan-Quinn	2440.592

Number of cases 'correctly predicted' = 2173 (82.5%)
f(beta'x) at mean of independent vars = 0.380
Likelihood ratio test: Chi-square(1) = 10.7295 [0.0011]

Appendix Model 8: Logit Regression Model Private Insurance 2016 with gender and race variables

Using observations 1-2634, Dependent variable: ACCESS
Standard errors based on Hessian

	Coefficient	*Std. Error*	*z*	*p-value*	
const	1.43667	0.133137	10.79	<0.0001	***
STATEDUMMY	−0.345854	0.106761	−3.240	0.0012	***
WHITE_PT	0.623128	0.140573	4.433	<0.0001	***
BLACK_PT	0.331462	0.132642	2.499	0.0125	**
FEMALE	−0.0509895	0.109158	−0.4671	0.6404	

Mean dependent var	0.824981	S.D. dependent var	0.380055
McFadden R-squared	0.012504	Adjusted R-squared	0.008410
Log-likelihood	−1206.259	Akaike criterion	2422.519
Schwarz criterion	2451.900	Hannan-Quinn	2433.157

Number of cases 'correctly predicted' = 2173 (82.5%)
f(beta'x) at mean of independent vars = 0.380
Likelihood ratio test: Chi-square(4) = 30.547 [0.0000]