

THE EFFECT OF THE AFFORDABLE CARE ACT MEDICAID EXPANSIONS ON
HOUSEHOLD HEALTH EXPENDITURES

by

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Abstract

In this paper, I investigate the effect of expanding Medicaid coverage on health expenditures among households headed by a nonelderly adult aged 18-64 years. Using household level health expenditure data from the Consumer Expenditure Survey (CE) for the years 2010-2016, I estimate a difference-in-differences model to compare states that did and did not adopt the Medicaid expansion. The main results show that the Medicaid expansions caused a significant decrease in overall health expenditures of \$16.44 per month per household, driven by a decrease in medical service expenditures of \$18.01 per month per household. There was no significant change in spending on health insurance, prescription drugs, or medical supplies. Further research is required to determine the mechanism of this decrease in medical service expenditures following an increase in insurance coverage.

1 Introduction

In 2010, the Patient Protection and Affordable Care Act (ACA) was passed with the goal of establishing universal health insurance coverage in the United States. The law includes a broad range of provisions aimed at individuals, employers, private insurance providers, and state and federal insurance providers (French et al., 2016). One provision of the ACA was an expansion of the state Medicaid programs by expanding Medicaid eligibility to include all non-Medicare eligible individuals under age 65 (children, pregnant women, parents, and adults without dependent children) with incomes up to 138% FPL. However, while a 2012 Supreme Court ruling upheld the constitutionality of the law, it made the decision to expand Medicaid

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optional for states (KFF, 2013). As a result, while 31 states and the District of Columbia have currently adopted the Medicaid expansion, 19 states have not.

I want to investigate the effect of expanding Medicaid coverage on health expenditures among households headed by a nonelderly adult aged 18-64 years. I estimate a difference-in-differences model to compare states that did and did not adopt the Medicaid expansion. Section 2 outlines the major ACA provisions and reviews the previous literature on the effects of health insurance reforms on insurance coverage, health care utilization and health expenditures; section 3 describes the primary data source, the Consumer Expenditure Survey (CE), which includes monthly household consumer expenditures for the years 2010-2016; section 4 describes the basic econometric model and regression equation; section 5 describes the results of the analysis and robustness checks; and section 6 describes some potential limitations of the analysis, possible solutions to these problems, and future policy implications of the results.

2 Literature Review

2.1 Health Insurance

Health insurance is a product that allows an individual to reduce the variability in their wealth due to uncertainty in future medical costs by pooling their risks (Folland et al., 2012). A health insurance plan is differentiated based on a number of characteristics. The main characteristics of a health insurance plan are the premium, the price that an individual pays an insurance company, and coverage, the amount of money that the insurance company pays the individual to cover the cost of their medical services. In addition to these two characteristics, insurance contracts typically have many other dimensions. For example, many insurance policies include a copayment, a fixed amount that the insured individual must pay out-of-pocket for a medical visit, or coinsurance rate, a percentage of the total medical bill for which the insured

individual must pay. Many policies also include a deductible, a minimum amount of a yearly medical bill that an individual must pay in order to receive any coverage from the insurance company. The insurance policy may also have exclusions, which are services or conditions that are not covered by the insurance plan. These often include spending on medical procedures purely for cosmetic purposes or experimental treatments that have not yet been widely approved. Similarly, an insurance policy might also include a limitation, a maximum amount of coverage that an insurance company will pay before the individual must bear the rest of their medical costs. This limitation usually takes the form of a maximum amount of coverage that an individual can receive over their lifetime (Folland et al., 2012).

In addition to variation in the amount of money that individuals must pay to an insurance company for a specific plan and vice versa, insurance policies also differ significantly in the network of physicians and hospitals included in their plan. The plan provides less coverage for an individual who visits a physician or hospital outside their network's plan, making it more expensive. Therefore, an individual may choose a health insurance plan based on the quality, location, or specialization of the physicians and hospitals included in their plan's network (Folland et al., 2012).

2.2 Health Insurance Legislation

2.2.1 Patient Protection and Affordable Care Act (ACA)

In 2010, the ACA was passed with the goal of establishing universal health insurance coverage in the U.S., and it includes a broad range of provisions (French et al., 2016). Table 1 shows the effective dates for each of these provisions. For example, the ACA imposed mandates and subsidies on both individuals and employers in order to increase insurance coverage and affordability. The individual mandate requires all residents age 18 or older to either maintain a

minimum level of essential coverage as outlined in the law or pay a tax penalty that increases annually by a cost-of-living adjustment. Individuals for whom the lowest cost plan option exceeds 8% of income and those with incomes below the tax filing threshold are exempt. Similarly, the employer mandate requires employers with 50 or more full-time employees to either offer affordable, comprehensive health insurance to full-time employees or pay a penalty for full-time employees who receive a premium tax credit. Employers with up to 50 full-time employees are exempt. In addition, the law establishes individual subsidies that provide premium credits in six tiers to U.S. citizens and legal immigrants at 100-400% of the federal poverty line (FPL) to purchase insurance through the newly created Health Insurance Exchanges, as well as cost sharing subsidies in four tiers to individuals and families at 100-400% FPL. Additional employer subsidies provide tax credits for employers with up to 25 employees and average wages of up to \$50,000 that provide coverage for their employees (KFF, 2013).

In order to streamline the process of obtaining health insurance, the ACA created state-based American Health Benefit Exchanges and Small Business Health Options Program (SHOP) Exchanges for individuals and businesses with up to 100 employees to purchase insurance. Through these Exchanges, it created four tiers of insurance plans and a “catastrophic plan” to be available for purchase. Furthermore, the law imposed regulations on private insurance firms to increase health insurance accessibility. For instance, it established a process to report and review increases in insurance plan premiums, and it prohibits insurance plans from including lifetime coverage limitations. A dependent coverage provision also increases the age that children are eligible to remain on their parents’ insurance plan to 26 (KFF, 2013). An adjusted community rating (ACR) provision requires insurance firms to offer the same premium price for all

individuals of the same age and geographic location, instead of price discriminating based on past medical history and pre-existing conditions (United HealthCare Services, 2013).

The ACA not only aims to increase health insurance coverage and affordability, but it also aims to improve overall national physical and mental wellness. It established the National Prevention, Health Promotion, and Public Health Council to coordinate national prevention, wellness, and public health initiatives as well as a Prevention and Public Health Fund for prevention, wellness, and public health activities. It also provides grants for up to five years for small employers that establish wellness programs (KFF, 2013).

Finally, while the ACA initially called for an expansion of state Medicaid programs, a 2012 Supreme Court ruling made the decision to expand Medicaid optional for states (KFF, 2013). As a result, while 31 states and the District of Columbia have currently adopted the Medicaid expansion, 19 states have not. An estimated 3.7 million adults are in the Medicaid “coverage gap” because their income is too high to qualify for Medicaid but too low to be eligible for premium tax credits (French et al., 2016).

Table 2 shows the current adoption decisions for each state and the effective dates for the Medicaid expansions (KFF, 2016). Regardless of whether or not states decide to expand Medicaid, the ACA still requires them to provide coverage for eligible children at current income eligibility levels through Medicaid and the Children’s Health Insurance Program (CHIP) until 2019. It also creates a new Medicaid state plan option to allow Medicaid enrollees with at least two chronic conditions, one condition and risk of developing another, or at least one serious and persistent mental health condition to receive home health care. Lastly, it provides states with the option to offer home and community-based services through a Medicaid state plan, and establishes the Community First Choice Option to provide community-based attendant supports

and services for individuals with disabilities who require an institutional level of care (KFF, 2016).

2.2.2 Massachusetts Health Insurance Law (Chapter 58)

In April 2006, Massachusetts passed Chapter 58, a health insurance reform law aimed at establishing universal health insurance coverage in Massachusetts. Like the ACA, it established an individual mandate requiring all residents age 18 or older to either maintain a minimum level of essential coverage as outlined in the law or pay a state income tax penalty. It also established an employer mandate requiring employers with 11 or more full-time employees to either make a “fair and reasonable” contribution to their employee’s health insurance or pay a “Fair Share Contribution” of up to \$295 per worker per year. Employers with 11 or more full-time employees whose uninsured workers frequently use the Uncompensated Care Pool must also pay a “Free Rider Surcharge.” The Uncompensated Care Pool, which became the Health Safety Net Fund in October 2007, supports hospitals and community health centers (CHCs) that provide health care to the residual uninsured and underinsured population (McDonough et al., 2006).

Chapter 58 also aimed to make health insurance more affordable and accessible by establishing two forms of free and subsidized health insurance for low income populations. The first is the Commonwealth Care Health Insurance Program (CCHIP), which provides subsidized health insurance coverage for uninsured adults with incomes up to 300% FPL. Those individuals below the federal poverty line pay no premiums or deductibles, while those with incomes at 100-300% FPL pay adjusted premiums and no deductibles. The second increase in free and subsidized insurance came in the form of an expansion in MassHealth, the state’s Medicaid program. The law expanded MassHealth eligibility to include children at 300% FPL and for populations who lost coverage during the 2002-2003 fiscal crisis. Finally, it established the

Commonwealth Health Insurance Connector Authority, an organization designed to oversee health insurance administration issues related to small businesses and individuals (McDonough et al., 2006).

2.3 Studies on the ACA and Massachusetts Health Insurance Legislation

2.3.1 Health Insurance Coverage

Previous research on both the ACA and the Massachusetts health insurance legislation has found a significant increase in health insurance coverage following the passing of these laws. French et al. (2016) find that the ACA has significantly decreased uninsurance rates, with an observed decrease from 20% in 2013 to 15% in 2014. Additionally, within the first five years following enactment, 11.7 million individuals purchased health insurance coverage through the Exchanges, 10.8 million additional individuals acquired coverage through Medicaid, and 3 million young adults acquired coverage under their parents' insurance plan. The law has had the greatest effect on young adults, low-income individuals, and minorities, improving insurance affordability and accessibility for these groups (French et al., 2016).

A second study investigates the effect of the ACA on health insurance coverage using a difference-in-differences model for states that did and did not adopt the Medicaid expansion, including time and state fixed-effects and a control for local area uninsurance rates. The primary source of data is the American Community Survey (ACS), a national survey administered by the Census Bureau with information about population and housing characteristics. Data is available for all 50 states and the District of Columbia at both the state and local level, with localities defined as Public Use Microdata Areas (PUMAs). The explanatory variables include age, gender, race/ethnicity, marital status, number of children, education, household income, and annual state unemployment rate. The results show that the adoption of the Medicaid expansion

significantly increased insurance coverage by 3.1 percentage points in 2014, while the other provisions of the ACA increased insurance coverage by 2.8 percentage points. Overall, the ACA has caused a 22.77% decrease in the uninsurance rate (Courtemanche et al., 2016).

These results are consistent with a similar study investigating the initial effect of the Massachusetts health insurance legislation on insurance coverage after one year. In this case, the data were from surveys with nonelderly adults aged 18-64 conducted in fall 2006 before the implementation of the reform, and fall 2007 approximately one year after the implementation of the reform. The specific outcome variables used include the presence of health insurance coverage and the type of insurance coverage an individual possesses. This study shows that almost 93% of nonelderly adults in Massachusetts were insured by fall 2007. Specifically, among adults with incomes below 300% FPL, the uninsurance rate decreased by 11 percentage points to 13%, and among adults with even lower incomes below 100% FPL, who are eligible for fully subsidized coverage under CCHIP, the uninsurance rate decreased by more than two-thirds to 10% (Long, 2008).

There is typically a concern that increasing public coverage through programs like MassHealth and CCHIP may crowd out private employer coverage instead of decreasing the share of uninsured adults. This crowd-out could occur through one of two mechanisms, either by a decrease in the number of employers who offer coverage to their employees or a decrease in the number of workers who enroll in the offered private insurance programs in favor of the new public insurance programs. Despite these concerns, the study found no evidence of crowd-out effects, even among low-income adults who would be more likely to switch from employer coverage to public coverage (Long, 2008).

Another study also investigated the effect of the Massachusetts health insurance legislation on insurance coverage two years after the implementation of the reform using a difference-in-differences model. They used data from the Current Population Survey (CPS), a nationally representative survey of hospital discharges, for 2004-2009, a period of time before and after the passing of Chapter 58. Consistent with the previous study, this study shows that the Massachusetts law increased the average level of insurance coverage among the nonelderly population in Massachusetts by 5.7 percentage points from 88.2% in 2004-2006 before the reform to 93.8% in 2008-2009 after the reform. Adoption of the Medicaid expansion specifically increased insurance coverage by 3.89 percentage points, and uninsurance rates decreased by 2.31 percentage points (Kolstad & Kowalski, 2012). This decrease in uninsurance rates is especially relevant for the nonelderly population, or individuals ages 18-64, who might become eligible for free and subsidized insurance, but are ineligible for Medicare.

2.3.2 Health Care Utilization and Health Expenditure

In addition to investigating the effect of the Massachusetts health insurance legislation on insurance coverage, Kolstad and Kowalski (2012) also consider the effect on health care utilization. The literature shows evidence for two opposing effects of an increase in insurance coverage on the intensity of care provided. One potential effect is that expanding health insurance coverage might decrease the price of health care services to consumers, thereby increasing the quantity demanded and the intensity of health care provided. An alternative effect is that expanding health insurance might create a monopsony for insurance companies, allowing them to set the price of health care services to consumers and restrict the quantity supplied, thereby decreasing the intensity of health care provided. Therefore, depending on the relative

magnitude of each effect, the quantity of health care services consumed could increase or decrease (Kolstad & Kowalski, 2012).

Using data from the Healthcare Cost and Utilization Project (HCUP) Nationwide Inpatient Sample (NIS), which contains annual information about all hospital discharges for each hospital in the dataset, for 2004-2008, the researchers measured the effect of increasing insurance coverage on various measures of patient severity. Controlling for demographic characteristics, the number of diagnoses on the discharge record, and different measures of comorbidities, they found that the Massachusetts law significantly decreased the length of hospital stay and the number of preventable hospital admissions. This suggests that when patients received health insurance, they substituted away from using the emergency room (ER) as a point of entry for treatment to using a channel such as primary care that allowed them to access preventative care. A decrease in use of the ER as a point of entry for inpatient care is beneficial because the cost of treating a patient in the ER is higher than the cost of treating the same patient in another setting. Consequently, substituting away from using the ER for nonemergent treatment decreases health care costs and allows patients to receive preventative care that will lead to better long-term health, instead of just receiving short-term treatment for acute health conditions (Kolstad & Kowalski, 2012).

Along with studying the effect of the Massachusetts legislation on insurance coverage, Long (2008) also investigated the effects on health care access, utilization, and expenditures. Using the same data from surveys with nonelderly adults ages 18-64 conducted in fall 2006 and one year later in fall 2007, this study measured the effects on health care access and utilization, including specific variables such as whether an individual has a place he/she usually goes when health care or advice is needed, the number of visits to doctors and other providers, and the

presence of an unmet need for health care. The study also measured the effects on out-of-pocket health care costs, including household expenditures on prescription drugs, dental and vision care, and spending on doctors, hospitals, tests, and equipment, as well as the quantity of medical debt (Long, 2008).

This study focused specifically on low-income adults in Massachusetts who would be directly affected by the legislation and found that low-income adults are more likely to have a place that they usually go to when health care or advice is needed. Within the time period examined, the likelihood of a low-income adult to have had a doctor visit for preventative care in the past year increased by six percentage points, and the likelihood of a low-income adult to have a dental care visit in the past year increased by nine percentage points. Furthermore, the levels of unmet need for health care due to cost barriers decreased by five percentage points for all nonelderly adults and by 10 percentage points for low-income adults. However, unlike Kolstad and Kowalski (2012), these results do not show a significant effect on emergency-department use for nonemergency conditions. With regard to household health expenditures, the results did show a significant decrease in the share of all adults who reported more than \$500 in out-of-pocket spending by four percentage points, with a decrease for low-income adults of 10 percentage points to 37%. There was also a decrease in the share of nonelderly adults who reported having medical debt (Long, 2008).

Although the results from these studies are unclear due to potential confounding factors affecting both the passing of Chapter 58 and health status and health care utilization, Taubman et al. (2014) were able to investigate the effect of increasing health insurance coverage on emergency-department use more effectively using a controlled experiment. They studied the effect of the Oregon Health Plan (OHP) Standard, a Medicaid expansion program for low-

income Oregon residents, ages 19-64, who were below the FPL, uninsured for 6 months, and ineligible for Medicaid or other insurance. Out of 90,000 applicants on the waiting list for the program, 30,000 names were randomly chosen in eight lottery drawings. They used visit-level data for all emergency department visits to 12 hospitals in the Portland area for 2007-2009.

In contrast to the previous study, these results clearly show that having Medicaid insurance significantly increased the probability of having an emergency department visit by 7.0 percentage points. In particular, having Medicaid increased the number of emergency department visits by 0.41 visits, a 41% increase compared to the control mean of 1.02 visits. When comparing the specific type of visit, they also found an increase in emergency department use that resulted in outpatient visits, but no effect on emergency department use that resulted in inpatient admission to a hospital. There was an increase in all types of emergency department use except for emergent, nonpreventable cases, with the greatest increase in emergency department use for primary care treatable and nonemergent cases. Finally, there was an increase in emergency department-use during both weekdays/day time and the weekends/night time (Taubman et al., 2014). These results suggest that increasing insurance coverage creates a moral hazard problem in which individuals consume a quantity of health care services, especially emergency care, which is higher than optimal.

Similar to these studies on the Massachusetts legislation and the Oregon Health Plan (OHP) Standard, Sommers et al. (2014), investigated the effect of the dependent coverage provision of the ACA prior to the implementation of the Medicaid expansions on health care utilization and health expenditures for young adults ages 18-25 years. They used data from the 2009 Medical Expenditure Panel Survey (MEPS), a nationally representative household survey that collects data on health insurance, medical care services utilization, and health expenditures.

Like the previous studies, there were several control variables, including insurance status, gender, language spoken at home, race/ethnicity, household income, education level, student status, and employment status. The results show that young adults have a lower rate of health care utilization compared with children and adolescents. Specifically, young adults who were uninsured had lower rates of office based, inpatient, and dental visits, as well as prescription medication use, but higher rates of emergency department visits compared to young adults with private or public coverage. Young adults without a usual source of care also had lower overall rates of health care utilization, but higher rates of emergency department and inpatient hospitalization utilization compared to young adults with a usual source. In terms of health expenditures, young adults who were uninsured had lower health expenditures compared to those with private coverage, and those with public coverage had lower out-of-pocket expenditures than those with private coverage. These results suggest that after the implementation of the Medicaid expansions, previously uninsured young adults who are able to obtain public coverage may experience an increase in health care utilization and overall health expenditures, as well as a decrease in out-of-pocket medical expenditures (Sommers et al., 2014).

While this study focused on the effects of the dependent coverage provision of the ACA, Nikpay et al. (2017) study the effects of the Medicaid expansions on household health expenditures using a difference-in-differences model in states that did and did not adopt the expansions. They use data from the Consumer Expenditure Survey (CE), a nationally representative household survey that collects data on consumer expenditures, for 2010-2014. They measure the effect of state Medicaid status, state health insurance marketplace type, and state-level prevalence of narrow network marketplace plans on average health insurance expenditures, household out-of-pocket medical expenditures, and health insurance premiums.

The results show that total out-of-pocket health expenditures decreased more in Medicaid expansion states than nonexpansion states among households headed by a low-skilled worker, with out-of-pocket spending on prescription drugs and medical care decreasing in particular. In addition, health expenditures decreased more among households headed by a low-skilled worker in states with state-based marketplaces compared to states with federally facilitated marketplaces (Nikpay et al., 2017). Modeling my analysis after this study, I estimate the effects of the Medicaid expansions on household health expenditures using a difference-in-differences model and data from the CE, for 2010-2016.

3 Data

My primary source of data is the Consumer Expenditure Survey (CE), a survey conducted by the Bureau of Labor Statistics (BLS), which conducts quarterly and monthly cross-sectional surveys of a randomly selected, representative sample of U.S. residents age 18 or older in all 50 states and the District of Columbia, for 2010 to the first quarter of 2016. The CE provides information on the complete range of consumers' expenditures and incomes, as well as the demographic characteristics of those consumers. These data are typically used to revise the market basket of goods and services used to calculate the Consumer Price Index, as well as to study consumers' spending habits and trends. The individual responses from the CE are available as public-use microdata (PUMD) files in several forms. For example, the FMLI-CU interview files contain one record for each consumer unit (CU), or household, per quarter and year, identified by a unique identification number. The variables in these files include demographic characteristics for a reference person within each CU and the spouse of the reference person, including a state identifier, income per CU, sample housing unit information, expenditure values, and weighting variables. Similarly, the MTBI interview files contain the same data represented

with multiple records per CU, with one record per expenditure per purchase month and year. Starting in 2010, these CUs are each also identified by the same unique identification number. Therefore, I match each monthly health expenditure in the MTBI files with a CU in the FMLI-CU files, and calculate an aggregate expenditure value per expenditure category per CU, month, and year. I only use observations for CUs in which the reference person is a nonelderly adult age 18-64 years, since adults 65 years and older are eligible for Medicare.

Next, I construct a dummy variable for each state to indicate that it is in the post-Medicaid expansion period. For the states that have adopted the Medicaid expansion, the dummy variable has a value of one for expenditures that took place during the month of the Medicaid expansion effective date from Table 2 onward. For the states that have not adopted the Medicaid expansion, the dummy variable has a value of zero for all expenditures. I also construct a dummy variable for each state to indicate whether or not it has adopted the Medicaid expansion. Using this dummy variable, I divide the data between states that have and have not adopted the Medicaid expansion and report mean household expenditures in five categories in Table 3: Health insurance, medical services, prescription drugs, medical supplies, and the sum of these 4 categories, overall health care. These summary statistics show that on average, households in states that adopted the Medicaid expansion had higher health expenditures for 2010-2016 in all categories except spending on prescription drugs. However, these statistics do not provide an explanation for the cause of these differences in spending or the time period during which they occurred.

As a result, to control for other demographic characteristics of households that participated in the survey, I include a collection of explanatory variables listed in Tables 5 and 6. These include the number of children less than 18 years old in the CU, the number of persons

over age 64 years old in the CU, the average age of the children, the income class of the CU based on income before taxes, the age of the reference person, the age of the spouse, the marital status of the reference person, the race of the spouse, the race of the reference person, the sex of the reference person, and the sex of the spouse. Together, these variables are used as controls in the following regression analysis. In addition, Table 4 shows the total number of observations for each state within each year during the period 2010-2015, as well as the last quarter of 2009 and the first quarter of 2016.

4 Econometric Model

In order to determine the effect of expanding Medicaid coverage on household health expenditures, I estimate the following difference-in-differences regression, modeled after Courtemanche et al. (2016), comparing states that did and did not adopt the Medicaid expansion:

$$Y_{ist} = \beta_0 + \beta_1(Medicaid_s \times Post_t) + \beta_2 X_{ist} + \alpha State_s + \gamma Year_t + \varepsilon_{ist}$$

where Y_{ist} measures the household expenditure within a given category i in state s in year t , $(Medicaid_s \times Post_t)$ is a dummy variable indicating that a state s in the year and month t is in the post-Medicaid expansion period of 2014-2016, and ε_{ist} is the error term. The regression also contains a vector, X_{ist} , that controls for the household demographic characteristics listed in Tables 5 and 6, and it includes state fixed effects $\alpha State_s$ and year fixed effects $\gamma Year_t$. The control variables and outcome variables are from the CE for 2010 to the first quarter of 2016. Modeling my analysis after Courtemanche et al. (2014), I estimate specifically the effect of expanding health insurance coverage through the Medicaid program on the nonelderly adult population ages 18-64 since individuals ages 65 and older are eligible to receive coverage through Medicare.

This difference-in-differences model is statistically sound because it includes multiple controls. First, the vector X_{ist} allows me to control for demographic characteristics such as income, age, marital status, race, sex, and household composition that may cause systematic differences in household health expenditures. Next, the state fixed effects α_{State_s} control for underlying characteristics of each state that are constant over time and may cause differences in a particular state's response to adopting the Medicaid expansion. Finally, the year fixed effects γ_{Year_t} control for overall changes over time that are common between states and may also cause a systematic response to adopting the Medicaid expansion. After controlling for these factors, it is less likely, although still possible, that there is an identification problem and one of the variables contained in the error term ε_{ist} is correlated with both the $(Medicaid_s \times Post_t)$ dummy variable indicating that a particular state is in the post-Medicaid expansion period and a health expenditure outcome variable.

5 Results

5.1 Main Results

Tables 5 and 6 show the main results of the difference-in-differences regression analysis to determine the effects of the Medicaid expansions on different types of household health expenditures. The first column of Table 5 shows that after controlling for demographic characteristics of the households, as well as including state and year fixed effects, there is not a significant difference in health insurance expenditures before and after the Medicaid expansions in states that did adopt the expansions compared to states that did not. In contrast, the second column shows a significant decrease of \$16.44 per month per household ($p < 0.01$) in spending on medical services. In addition, the coefficients for the Medicaid expansion indicator on prescription drug expenditures and medical supply expenditures are also not significant, but there

is an overall significant decrease of \$18.01 per month per household ($p < 0.05$) in spending on health care in general.

Therefore, these results suggest that the Medicaid expansions caused a significant decrease in overall health expenditures for households in which the head of the household was a nonelderly adult in a state that adopted the expansion, and this decrease was driven specifically by a decrease in medical service expenditures. This is consistent with previous research showing that an increase in health insurance coverage through a mechanism such as the Medicaid expansions can cause patients to substitute away from using more expensive sources of medical care such as the ER to using less expensive primary care services and obtaining preventative care (Kolstad & Kowalski, 2012). Thus, while household health insurance expenditures might decrease, stay the same, or increase after the Medicaid expansions due to an increase in insurance coverage for nonelderly adults, it is plausible that overall health expenditures decreased due to a decrease in out-of-pocket health care expenditures and a decrease in the need for more expensive medical care for severe cases requiring treatment in the ER.

5.2 Robustness Checks

In order to check the robustness of these results, I create three additional dummy variables similar to the original Medicaid expansion indicator to indicate the months one year prior to the Medicaid expansion in states that adopted the expansion, the months two years prior, and the months 1 year after respectively. These variables are used to determine whether there was a significant change in household health expenditures either before or after the Medicaid expansion that could confound the results shown in Table 5. The first column of Table 6 shows that there was a significant increase in household health insurance expenditures of \$7.64 per month per household ($p < 0.10$) after the Medicaid expansion compared to before in states that

adopted the expansion, but there was also a significant increase when comparing the months before and after one year prior to the expansions and a significant decrease when comparing the months before and after one year after the expansions. Therefore, the results for health insurance expenditures are unclear. It is possible that insurance expenditures initially increased as more nonelderly individuals gained health insurance coverage in states that adopted the Medicaid expansion, but later decreased due to a decrease in premiums or insurance cost.

The second column of Table 6, like Table 5, shows that medical service expenditures significantly decreased by \$14.16 per month per household ($p < 0.10$), although there was a significant increase two years before the Medicaid expansions. The third column shows that there was a significant increase in prescription drug expenditures of \$3.00 per month per household ($p < 0.10$) before and after the Medicaid expansions, but a significant decrease two years before. The fourth column shows no significant change in medical supply expenditures, and the fifth column shows a significant increase in overall health care expenditures two years before the Medicaid expansions, but a significant decrease of \$49.92 per month per household ($p < 0.01$) one year after the expansions. Therefore, while the timing of the relationship between the Medicaid expansions and the change in household health expenditures is unclear, these results are consistent with the idea that overall health care expenditures decreased after the Medicaid expansions due to a decrease in spending on medical services. However, this effect may have taken up to a year to occur.

6 Discussion and Conclusions

In this paper, I investigate the effect of expanding Medicaid coverage on health expenditures among households headed by a non-elderly adult aged 18-64 years by estimating a difference-in-differences regression for states that did and did not adapt the Medicaid expansion.

The main results show that there was a significant decrease of \$18.01 per month per household in overall health care expenditures, and a significant decrease of \$16.44 per month per household, with no significant change in spending on health insurance, prescription drugs, or medical supplies. These results are consistent with previous research on the Massachusetts health insurance reform that showed a significant increase in insurance coverage following the enactment of a state law similar to the Medicaid expansion that also increased the eligibility for subsidized or free health insurance to a larger proportion of the low-income population. Following the increase in coverage, patients substituted away from using the ER as a point of entry for inpatient care to seeking less expensive and urgent care from their primary care physicians (Kolstad & Kowalski, 2012).

Nevertheless, the analysis in this paper has several limitations. First, there is a potential identification problem if the decision to adopt the Medicaid expansion in a particular state is correlated with both the general health of the state or another underlying factor as well as health outcomes for the nonelderly adult population in that state. For example, a state with poor health might have chosen to adopt the Medicaid expansion in order to increase insurance coverage and decrease health care costs by increasing the proportion of the state residents receiving preventative care and decreasing the proportion of individuals using the emergency room as point of entry for health care. As a result, I use state fixed effects to control for these potential underlying factors specific to each state over time.

A second major limitation of the data is that it only provides information at the CU or household level. As a result, it is only possible to determine changes in health expenditures per household, and the data only includes demographic characteristics such as age, marital status, race, and sex for the designated head of the household and spouse. Therefore, I am only able to

control for these characteristics and not the characteristics of each individual within the household. This is a potential identification problem if there is a non-random relationship between the characteristics of the members of each household and the response of that household's health expenditures to the adoption of the Medicaid expansions.

Furthermore, as an extension of this research, it would be interesting to investigate possible heterogeneous effects of the Medicaid expansion on individuals within states that adopted the expansion, by factors such as age (e.g. young adults vs. older nonelderly adults), race, urban vs. rural area of residence, and the presence of a child in the household.

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Appendix

Table 1: Effective Dates for Selected ACA Provisions

<i>Provision</i>	<i>Effective date</i>
Individual mandate	January 1, 2014
Employer mandate	January 1, 2014
Individual subsidies	January 1, 2014
Employer subsidies	Immediately
Health insurance Exchanges	Established from within one year of enactment to January 1, 2015
Report/review process for increases in insurance plan premiums	Beginning plan year 2010
Dependent coverage	September 2010
Prohibition of lifetime coverage limitations	Six months following enactment
National Prevention, Health Promotion, and Public Health Council	Must submit a strategy to improve national health within one year following enactment
Prevention and Public Health Fund	Fiscal year 2010
Adjusted community rating	January 1, 2014
Medicaid expansion	January 1, 2014
Medicaid state plan option to allow Medicaid enrollees to receive home health care	January 1, 2011
Home and community-based services through a Medicaid state plan	October 1, 2010
Community First Choice Option	October 1, 2011

Table 2: Medicaid Expansion by State as of October 14, 2016 (KFF, 2016)

<i>State</i>	<i>State Identifier</i>	<i>Adopted the Medicaid expansion</i>	<i>Medicaid expansion effective date</i>
Alabama	01	No	N/A
Alaska	02	Yes	September 1, 2015
Arizona	04	Yes	January 1, 2014
Arkansas	05	Yes	January 1, 2014
California	06	Yes	January 1, 2014
Colorado	08	Yes	January 1, 2014
Connecticut	09	Yes	January 1, 2014
Delaware	10	Yes	January 1, 2014
District of Columbia	11	Yes	January 1, 2014
Florida	12	No	N/A
Georgia	13	No	N/A
Hawaii	15	Yes	January 1, 2014
Idaho	16	No	N/A
Illinois	17	Yes	January 1, 2014
Indiana	18	Yes	February 1, 2015
Iowa	19	Yes	January 1, 2014
Kansas	20	No	N/A
Kentucky	21	Yes	January 1, 2014
Louisiana	22	Yes	July 1, 2016
Maine	23	No	N/A
Maryland	24	Yes	January 1, 2014
Massachusetts	25	Yes	January 1, 2014
Michigan	26	Yes	April 1, 2014
Minnesota	27	Yes	January 1, 2014
Mississippi	28	No	N/A
Missouri	29	No	N/A
Montana	30	Yes	January 1, 2016
Nebraska	31	No	N/A
Nevada	32	Yes	January 1, 2014
New Hampshire	33	Yes	August 15, 2014
New Jersey	34	Yes	January 1, 2014
New Mexico	35	Yes	January 1, 2014
New York	36	Yes	January 1, 2014
North Carolina	37	No	N/A
North Dakota	38	Yes	January 1, 2014
Ohio	39	Yes	January 1, 2014
Oklahoma	40	No	N/A
Oregon	41	Yes	January 1, 2014
Pennsylvania	42	Yes	January 1, 2015
Rhode Island	44	Yes	January 1, 2014
South Carolina	45	No	N/A

South Dakota	46	No	N/A
Tennessee	47	No	N/A
Texas	48	No	N/A
Utah	49	No	N/A
Vermont	50	Yes	January 1, 2014
Virginia	51	No	N/A
Washington	53	Yes	January 1, 2014
West Virginia	54	Yes	January 1, 2014
Wisconsin	55	No	N/A
Wyoming	--	No	N/A

Table 3: Mean Household Health Expenditures by Medicaid Expansion Status

<i>Type of health expenditure</i>	<i>States that adopted the Medicaid expansion (n = 136,838)</i>	<i>States that did not adopt the Medicaid expansion (n = 78,215)</i>
Health insurance	139.0906	121.3432
Medical services	101.0097	99.28562
Prescription drugs	31.65933	37.68584
Medical supplies	11.04813	9.940651
Health care	282.8077	268.2553

Table 4: CE Observations by State and Year

<i>State</i>	<i>Year</i>								<i>Total</i>
	<i>2009</i>	<i>2010</i>	<i>2011</i>	<i>2012</i>	<i>2013</i>	<i>2014</i>	<i>2015</i>	<i>2016</i>	
1	68	421	510	543	665	791	1,233	97	4,328
2	64	320	320	261	406	545	536	45	2,497
4	93	615	665	721	746	700	841	85	4,466
6	755	4,045	3,899	3,780	4,145	4,445	4,223	351	25,643
8	64	436	484	487	535	560	580	49	3,195
9	98	537	517	478	408	421	417	54	2,930
10	26	139	107	146	142	104	92	4	760
11	27	93	79	67	92	102	79	9	548
12	349	1,825	1,680	1,678	2,088	2,108	2,076	169	11,973
13	136	1,073	1,128	1,048	1,085	1,188	859	62	6,579
15	66	417	490	498	473	406	400	42	2,792
16	54	424	432	400	473	412	32	0	2,227
17	312	1,658	1,664	1,552	1,885	1,904	1,677	128	10,780
18	86	536	482	446	493	523	267	18	2,851
19	0	0	0	0	0	4	49	8	61
20	40	191	178	152	130	164	463	32	1,350
21	140	752	502	617	813	743	790	64	4,421
22	107	752	752	807	919	1,046	871	66	5,320
23	34	232	207	235	222	238	26	0	1,194
24	106	742	707	780	847	803	721	60	4,766
25	166	998	938	948	787	716	820	69	5,442
26	155	1,001	996	897	1,088	1,029	984	83	6,233
27	114	657	623	544	610	575	621	47	3,791
28	0	0	0	0	0	17	234	14	265
29	93	548	529	589	695	686	458	38	3,636
31	49	305	303	272	351	319	765	65	2,429
32	58	322	255	298	265	350	309	23	1,880
33	21	135	132	132	149	163	71	1	804
34	201	1,134	1,215	1,203	1,213	1,272	1,081	67	7,386
36	361	2,080	2,040	1,899	1,653	1,949	2,303	146	12,431
37	0	0	0	0	0	142	1,721	141	2,004
39	158	899	911	852	845	957	1,553	138	6,313
40	0	0	0	0	0	33	369	18	420
41	151	720	610	637	653	750	599	53	4,173
42	294	1,868	2,043	2,167	2,199	2,268	1,878	142	12,859
45	161	842	745	938	1,004	944	648	35	5,317
47	121	510	478	486	411	623	650	47	3,326
48	387	2,524	2,487	2,344	2,685	2,999	2,741	222	16,389
49	71	449	472	449	480	518	903	85	3,427

51	208	1,315	1,304	1,168	1,138	1,298	946	68	7,445
53	126	779	678	637	696	776	637	67	4,396
54	1	19	24	15	36	5	0	0	100
55	158	940	873	941	978	919	1,013	84	5,906
Total	5,679	33,253	32,459	32,112	34,503	36,515	37,536	2,996	215,053

Table 5: Effects of Medicaid Expansions on Household Health Expenditures

<i>Variables</i>	<i>(1) Health insurance expenditures</i>	<i>(2) Medical service expenditures</i>
Medicaid expansion indicator	-1.065 (3.198)	-16.44*** (5.905)
Number of children less than 18	4.887*** (0.781)	13.01*** (1.442)
Number of persons over 64	70.07*** (2.855)	-14.83*** (5.272)
Age of children	1.161*** (0.319)	0.882 (0.589)
Income class	2.994*** (0.553)	8.009*** (1.020)
Age of reference person	0.708*** (0.171)	1.201*** (0.316)
Age of spouse	0.675*** (0.166)	0.851*** (0.306)
Education of reference person	0.426 (0.567)	7.421*** (1.047)
Education of spouse	1.582*** (0.545)	5.773*** (1.007)
Race of spouse	0.298 (1.217)	-7.740*** (2.247)
Race of reference person	-3.448*** (1.226)	-6.310*** (2.264)
Sex of reference person	-18.90 (15.97)	-17.00 (29.48)
Sex of spouse	-14.81 (15.96)	-17.72 (29.47)
Constant	13.96 (49.19)	-234.3*** (90.82)
Observations	122,090	122,090
R-squared	0.046	0.008
State FE	YES	YES
Year FE	YES	YES

(3) <i>Prescription drug expenditures</i>	(4) <i>Medical supply expenditures</i>	(5) <i>Health care expenditures</i>
0.175	-0.678	-18.01**
(1.263)	(1.093)	(7.026)
-1.147***	0.583**	17.33***
(0.308)	(0.267)	(1.715)
-1.610	-0.983	52.65***
(1.128)	(0.976)	(6.273)
0.596***	0.250**	2.889***
(0.126)	(0.109)	(0.701)
1.068***	0.987***	13.06***
(0.218)	(0.189)	(1.214)
1.035***	0.221***	3.165***
(0.0675)	(0.0584)	(0.375)
0.370***	0.131**	2.027***
(0.0655)	(0.0567)	(0.364)
0.0553	0.710***	8.612***
(0.224)	(0.194)	(1.246)
0.813***	1.168***	9.335***
(0.215)	(0.186)	(1.198)
-1.360***	-0.510	-9.313***
(0.481)	(0.416)	(2.674)
-2.128***	-0.0920	-11.98***
(0.484)	(0.419)	(2.694)
22.36***	-0.521	-14.06
(6.307)	(5.457)	(35.08)
19.14***	-2.728	-16.12
(6.304)	(5.454)	(35.06)
-78.98***	-36.88**	-336.2***
(19.43)	(16.81)	(108.1)
122,090	122,090	122,090
0.036	0.004	0.019
YES	YES	YES
YES	YES	YES

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6: Effects of Medicaid Expansions on Household Health Expenditures with Indicators for 1 Year Before, 2 Years Before, and 1 Year After Expansions

<i>Variables</i>	<i>(1) Health insurance expenditures</i>	<i>(2) Medical service expenditures</i>
Medicaid expansion indicator	7.643* (4.409)	-14.16* (8.141)
Medicaid expansion indicator -1 year	8.643** (4.400)	-5.543 (8.125)
Medicaid expansion indicator -2 years	3.935 (3.976)	14.68** (7.342)
Medicaid expansion indicator +1 year	-37.79*** (4.706)	-12.03 (8.690)
Number of children less than 18	4.929*** (0.781)	13.03*** (1.442)
Number of persons over 64	70.05*** (2.855)	-14.93*** (5.272)
Age of children	1.180*** (0.319)	0.882 (0.589)
Income class	3.014*** (0.553)	8.023*** (1.020)
Age of reference person	0.708*** (0.171)	1.202*** (0.316)
Age of spouse	0.680*** (0.166)	0.852*** (0.306)
Education of reference person	0.436 (0.567)	7.418*** (1.048)
Education of spouse	1.603*** (0.545)	5.773*** (1.007)
Race of spouse	0.261 (1.217)	-7.750*** (2.247)
Race of reference person	-3.348*** (1.226)	-6.293*** (2.264)
Sex of reference person	-19.60 (15.96)	-17.11 (29.48)
Sex of spouse	-15.55 (15.96)	-17.89 (29.47)
Constant	15.59 (49.19)	-231.0** (90.83)
Observations	122,090	122,090

R-squared	0.047	0.008
State FE	YES	YES
Year FE	YES	YES

(3)	(4)	(5)
<i>Prescription drug expenditures</i>	<i>Medical supply expenditures</i>	<i>Health care expenditures</i>
3.003*	-2.086	-5.596
(1.742)	(1.507)	(9.687)
-0.738	0.294	2.655
(1.738)	(1.504)	(9.668)
-4.634***	2.105	16.09*
(1.570)	(1.359)	(8.735)
-0.839	0.736	-49.92***
(1.859)	(1.608)	(10.34)
-1.159***	0.588**	17.39***
(0.308)	(0.267)	(1.715)
-1.568	-1.003	52.55***
(1.128)	(0.976)	(6.273)
0.599***	0.248**	2.910***
(0.126)	(0.109)	(0.701)
1.063***	0.989***	13.09***
(0.218)	(0.189)	(1.214)
1.035***	0.221***	3.166***
(0.0675)	(0.0584)	(0.375)
0.370***	0.131**	2.032***
(0.0655)	(0.0567)	(0.364)
0.0529	0.711***	8.618***
(0.224)	(0.194)	(1.246)
0.822***	1.163***	9.362***
(0.215)	(0.186)	(1.198)
-1.362***	-0.509	-9.360***
(0.481)	(0.416)	(2.673)
-2.123***	-0.0950	-11.86***
(0.484)	(0.419)	(2.694)
22.25***	-0.466	-14.92
(6.306)	(5.457)	(35.08)
19.04***	-2.677	-17.07
(6.303)	(5.454)	(35.06)
-80.51***	-36.18**	-332.1***
(19.43)	(16.81)	(108.1)
122,090	122,090	122,090
0.036	0.004	0.019
YES	YES	YES
YES	YES	YES

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1