ABSTRACT

Title of Dissertation: PREVENTIVE CARE UTILIZATION AND ITS IMPACT ON POTENTIALLY PREVENTABLE HOSPITALIZATIONS: IMPLICATIONS OF MEDICAID COST-SHARING, MEDICAID EXPANSION, AND THE AFFORDABLE CARE ACT FOR VULNERABLE POPULATIONS

Robin Frances Bloodworth,
Doctor of Philosophy, 2017

Dissertation directed by: Dr. Jie Chen, Associate Professor,
Health Services Administration,
University of Maryland School of Public Health

About half of Americans have at least one chronic disease, and chronic diseases account for nearly 90% of healthcare expenditures in the US. Primary care can reduce potentially preventable hospitalizations and overall costs of chronic diseases. However, only about 3% of US healthcare spending is on prevention. Racial/ethnic disparities and income disparities have been well documented in the use of primary care. The ACA expanded insurance coverage for millions of Americans and included a mandate that all insurance plans must cover recommended preventive services at no cost to the patient. Literature shows the ACA resulted in an increase in access to care, but results on utilization rates of primary care post-ACA are mixed. Using nationally representative data sets from 2009-2015, I examined the utilization

rates of preventive services among vulnerable populations after the full implementation of the ACA, and how Medicaid state policy and expansion under the ACA affected the utilization of preventive services among vulnerable populations. Next, using the Maryland Medical Care Database from 2012-2014, I examined how continuity of primary care affects the odds of having any hospitalization as well as potentially preventable hospitalizations. I found that the ACA was associated with an increase in preventive services recommended yearly, and the ACA was not associated with disparities in preventive service utilization among vulnerable populations. Additionally, I found that state Medicaid policies on preventive services were associated with increased utilization of flu shot, but Medicaid expansion was not associated with increased utilization of preventive services or many changes in disparities in preventive service utilization among vulnerable populations. Finally, I found that primary care, especially ongoing primary care, was strongly associated with a decrease in the odds of having any hospitalization and potentially preventable hospitalizations. Results suggest that increased access alone will not increase utilization rates and reduce health disparities, but rather, a focus on education of what coverage options are available through the ACA, the importance of ongoing primary care, and how to navigate the healthcare system once insured could increase utilization of preventive care, especially in vulnerable populations.

PREVENTIVE CARE UTILIZATION AND ITS IMPACT ON POTENTIALLY PREVENTABLE HOSPITALIZATIONS: IMPLICATIONS OF MEDICAID COST-SHARING, MEDICAID EXPANSION, AND THE AFFORDABLE CARE ACT FOR VULNERABLE POPULATIONS

by

Robin Frances Bloodworth

Dissertation submitted to the Faculty of the Graduate School of the
University of Maryland, College Park, in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
2017

Advisory Committee:
Professor Jie Chen, Chair
Professor Michel Boudreaux
Professor Stephen Thomas
Professor Xin He, Dean's Representative
Professor Karoline Mortensen, Special Member

Acknowledgements

I would like to thank Ray Kuntz, the Agency for Healthcare Research and Quality Center for Financing, Access, and Cost Trends Data Center Coordinator, for his assistance in accessing and analyzing the restricted state-level Medical Expenditure Panel Survey data.

Table of Contents

Acknowledgements ii
Table of Contents iii
List of Tables vi
List of Figures vii
Chapter 1: Introduction 1
INTRODUCTION 1
The Burden of Chronic Diseases and the Benefit of Preventive Services 1
Disparities in Chronic Diseases and Access to Primary Care and Preventive Services 2
Measuring the Effectiveness of Preventive Services 4
The Impact of the Affordable Care Act 6
Effects to Date of the Affordable Care Act 10
Conceptual Framework 11
DISSERTATION SUMMARY 14
CONCLUSION 16
Chapter 2: Preventive Service Use Among Vulnerable Populations: Evidence after the Full Implementation of the Affordable Care Act 18
INTRODUCTION 18
Chronic Diseases and Preventive Services 18
The Affordable Care Act, Access to Care, and Vulnerable Populations 19
Study Objectives 22
METHODS 23
Data 23
Dependent Variables 23
Key Independent Variables 24
Other Independent Variables 25
Sample 25
Analysis 26
RESULTS 27
Population Characteristics 27
Model 1: Logistic Regression Examining the Utilization of Preventive Services 28
Model 2: Logistic Regression Examining the Association between the ACA and Utilization of Preventive Services among Vulnerable Populations 30
Model 3: Logistic Regression Examining the Association between Exchange Plans and the Utilization of Preventive Services among the Privately Insured 31
DISCUSSION 32
Limitations 39
CONCLUSIONS AND POLICY IMPLICATIONS 40
FIGURES 41
TABLES 42
Chapter 3: Variation of Preventive Service Utilization by State Medicaid Coverage and Cost Sharing Policies and Medicaid Expansion Status 48

INTRODUCTION 48
Chronic Conditions and Preventive Care 48
Medicaid Coverage of Preventive Care 49
Medicaid Expansion and Preventive Care 50
The Affordable Care Act and Vulnerable Populations 52
Study Objectives 53
METHODS 54
Data 54
Dependent Variables 55
Key Independent Variables 56
Other Independent Variables 57
Sample 57
Analysis 58
RESULTS 60
Population Characteristics 60
Model 1: Association of State Medicaid Policy with Utilization of Preventive Services (MEPS 2010 & 2013) 60
Model 2: Effect of Medicaid Expansion on Utilization of Preventive Services (MEPS 2009-2014) 62
Model 3: Effect of Medicaid Expansion on Utilization of Preventive Services among Vulnerable Populations (MEPS 2009-2014) 63
DISCUSSION 64
Limitations 67
CONCLUSIONS AND POLICY IMPLICATIONS 68
FIGURES 70
TABLES 74
Chapter 4: Effect of Primary Care Utilization on Potentially Preventable Hospitalizations – Evidence from the Maryland Medical Care Database 80
INTRODUCTION 80
Chronic Conditions and Primary Care 80
Prevention Quality Indicators: Measuring Primary Care Effectiveness 81
Ambulatory Care Sensitive Conditions and Preventive Services 82
Disparities in Ambulatory Care Sensitive Conditions 82
Disparities in Preventive Care 84
Study Objectives 84
METHODS 85
Data 85
Sample 87
Dependent Variables 87
Key Independent Variables 88
Other Independent Variables 88
Analysis 89
RESULTS 91
Population Characteristics 91
Model 1 – Panel Logistic Regression Results 92

Model 2 – Panel Logistic Regression Results Including Primary Care Lag Effects 93
Model 3 – Panel Ordered Logistic Regression Results 95
Model 4 – Panel Ordered Logistic Regression Results Including Primary Care Lag Effects 96
DISCUSSION 98
Limitations 102
CONCLUSION AND POLICY IMPLICATIONS 104
FIGURES 105
TABLES 108
Chapter 5: Conclusions 116
SUMMARY 116
FINDINGS 116
Major Findings of Study 1 (Chapter 2) 116
Major Findings of Study 2 (Chapter 3) 118
Major Findings of Study 3 (Chapter 4) 119
RESEARCH LIMITATIONS AND STRENGTHS 120
POLICY IMPLICATIONS AND FUTURE RESEARCH 121
CONCLUSION 125
APPENDICES 127
Appendix 3.1: State Medicaid Expansion Status as of January 1, 2014 127
REFERENCES 129

List of Tables

Table 2.1: Model 1 – Logistic Regression Results (Odds Ratios) Examining Utilization Patterns of Preventive Services Among Vulnerable Populations ……..……...42

Table 2.2: Model 2 – Logistic Regression Results (Odds Ratios) Assessing Whether the Full Implementation of the Affordable Care Act was Associated with Utilization Patterns of Preventive Services among Vulnerable Populations ……..44

Table 2.3: Model 3 – Logistic Regression Results (Odds Ratios) Examining Association of Having Insurance Purchased through the Affordable Care Act Exchanges with the Odds of Utilization of Preventive Services among the Privately Insured 2014 and 2015 ...…….46

Table 3.1: Model 1 – Logistic Regression Results (Odds Ratios) Examining Association of Medicaid Coverage of and Copay for Preventive Services on Utilization of Preventive Services (MEPS 2010 & 2013)…..……...……74

Table 3.2 Model 2 – Difference-in-Differences Linear Probability Regression Results Examining the Effect of Medicaid Expansion on Utilization of Preventive Services (MEPS 2009-2014)..…..…….76

Table 3.3 Model 3 – Difference-in-Difference-in-Differences Linear Probability Regression Results Examining the Effect of Medicaid Expansion on Utilization of Preventive Services Among Vulnerable Populations (MEPS 2009-2014)…….…….78

Table 4.1: Population Characteristics for Individuals in the Maryland Medical Care Database from 2012-2014)...……....……108

Table 4.2 Panel Logistic Regression Result (Odds Ratios) Examining the Effect of Primary Care on the odds of having an Ambulatory Care Sensitive Condition Hospitalization among Those Hospitalized in Maryland in 2012-2014…..……110

Table 4.3 Panel Logistic Regression Result (Odds Ratios) Examining the Effect of Primary Care on the odds of having an Ambulatory Sensitive Hospitalization among Those Hospitalized in Maryland 2012-2014, Including a One Year Lag Effect of Primary Care ……...……111

Table 4.4 Panel Ordered Logistic Regression Results (Odds Ratios) Examining the Effect of Primary Care on the odds of Having any Hospitalization and the Odds of Having an Ambulatory Care Sensitive Condition Hospitalization in Maryland in 2012-2014 ...……113

Table 4.5 Panel Ordered Logistic Regression Results (Odds Ratios) Examining the Effect of Primary Care on the odds of Having any Hospitalization and the Odds of Having an Ambulatory Care Sensitive Condition Hospitalization in Maryland in 2012-2014, Including a One Year Lag Effect in Primary Care ..……...……114

List of Figures

Figure 1.1: The Andersen Behavioral Model of Health Service Use …..…….13
Figure 2.1: Utilization of Preventive Services Before and After the Full Implementation of the ACA…….41
Figure 3.1: Distribution of Population by State Medicaid Policies on Preventive Services……70
Figure 3.2: Utilization Rates of Preventive Services Among Medicaid Beneficiaries by Year……..71
Figure 3.3: Utilization of Preventive Services Among Medicaid Beneficiaries Before and After Medicaid Expansion……....72
Figure 3.4 Utilization of Preventive Services Among Medicaid Beneficiaries in Expansion versus Non-expansion States…….73
Figure 4.1: Structure of Dataset……105
Figure 4.2: Concentration of Ambulatory Care Sensitive Conditions by Zip Code among the Privately Insured in Maryland (2012-2014)…….106
Figure 4.3: Concentration of Primary Care Utilization by Zip Code among the Privately Insured in Maryland (2012-2014)...…….……..107

Chapter 1: Introduction

INTRODUCTION

The goal of this chapter is to examine the relationship between chronic conditions, access to care, utilization of primary care, and how the Patient Protection and Affordable Care Act (ACA) has affected this relationship, particularly for vulnerable populations. First, I conduct an in-depth literature review on each of these topics and how they are related to one another. I then give a brief summary of my three dissertation studies, and finally, I explain how my dissertation fills gaps in the current literature.

The Burden of Chronic Diseases and the Benefit of Preventive Services

Chronic diseases can result in high levels of healthcare expenditures, and it has been suggested that access to care and preventive services can help curb these cost. It is estimated that 70% of deaths in the United States are due to chronic diseases, and almost 50% of US adults have at least one chronic disease (Centers for Disease Control and Prevention [CDC], 2014a). Chronic disease related illnesses made up 86% of all healthcare expenditures in 2010 (Gerteis et al., 2014), and healthcare expenditures accounted for 17.4% of Gross Domestic Product spending in the United States in 2013 (Hartman, Martin, Lassman, & Catlin, 2015). However, in the US, only about 3 cents of every dollar are spent on prevention (Kemp et al., 2012).

Access to primary care and preventive services can potentially help curb the cost associated with chronic disease (CDC, 2013). Early screening and detection can

prevent chronic diseases from worsening and sometimes from occurring all together, which could help curb the costs associated with chronic conditions in some cases (CDC, 2013). It is estimated that if more people utilized preventive services, two million life years could be saved annually (Maciosek, Coffield, Flottemesch, Edwards, & Solberg, 2010). Specifically, it is estimated that 14,000 lives could be saved each year if the percentage of adults receiving adequate colorectal cancer screening preventive services increased to 90%, and 3,700 lives could be saved each year if the percentage of women receiving adequate breast cancer screenings increased to 90% (Robert Wood Johnson Foundation [RWJF], 2007).

Disparities in Chronic Diseases and Access to Primary Care and Preventive Services

One of the main proponents exacerbating the high prevalence of chronic diseases in America is that many Americans who need preventive care may not have timely access to and/or cannot afford it (Cheung, Wiler, Lowe, & Ginde, 2012; Meissner, Klabunde, Breen, & Zapka, 2012). The Institute of Medicine (IOM) defines a health disparity as a difference in access and/or utilization of health services among different populations that cannot be explained by difference in health conditions or treatment preferences of patients (Nelson, 2002). Ongoing healthcare reform includes policies that focus specifically on decreasing disparities in access to care for vulnerable populations. Vulnerable populations include racial and/or ethnic minorities, economically disadvantaged individuals, individuals who are seriously ill, and institutionalized individuals (National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research [NCPHSBBR], 1979).

Vulnerable populations. Racial and ethnic minorities face substantial disparities in access to care and health outcomes. Non-Latino Blacks (United States Department of Health and Human Services [DHHS], 2016a), Asians (DHHS, 2014a), and Latinos (DHHS, 2015a) have lower rates of health insurance and experience higher rates of morbidity and mortality than non-Latino Whites. However, literature also shows that minorities often have higher rates of preventive services than non-Latino Whites (Holden, Chen, & Dagher, 2015). Low-income populations also experience disparities in access to care and health outcomes. From 2013-2015, low-income adults were more likely to be uninsured, less likely to have a usual source of care and to have visited a healthcare professional during the last year than their higher-income counterparts (Martinez & Ward, 2016). According to the World Health Organization, poor individuals are more likely to have chronic diseases due to greater exposures to the risk factors of chronic diseases, as well as less access to healthcare (World Health Organization, 2017). This is further supported by a study that found low-income populations have had lower utilization rates of preventive services than their higher-income counterparts (Fox & Shaw, 2015)**.**

Medicaid Beneficiaries. Medicaid provides health insurance coverage at little to no cost to low-income Americans. Eligibility for Medicaid is based on income, with states historically setting their own thresholds as a percentage of the Federal Poverty Level (FPL). Medicaid eligibility levels vary from state to state, with eligibility ranging from 0%-215% FPL for childless adults, 18%-221% FPL for parents of dependent children, and 138%-380% FPL for pregnant women (Paradise, 2015). As of December 2016, Medicaid covered about 68 million individuals, which

is about 1/5th of the US population (Centers for Medicare & Medicaid Services [CMS], 2017).

Although Medicaid beneficiaries typically have better access to and utilization of care than their uninsured counterparts (Long et al., 2012), Medicaid beneficiaries have been shown to have poorer access to primary care and higher utilization of ED than privately insured (Cheung et al., 2012). Additionally, chronic condition rates among Medicaid beneficiaries are the highest compared to the rates of the privately insured (Smolen, Thorpe, Bowie, Gaskin, & LaVeist, 2014) and the uninsured (Kaiser Commission on Medicaid and the Uninsured [KCMU], 2012a). There is also variation in state Medicaid program coverage of preventive services, and if the preventive service is covered, whether there is any cost sharing (KCMU, 2012b; Gates, Ranji, & Snyder, 2014).

Measuring the Effectiveness of Preventive Services

Ambulatory care sensitive conditions. Providing people with insurance coverage and access to care is just the first step. Even with 100% insurance coverage, how do we know if preventive services are making a difference in health outcomes? The Agency of Healthcare Research and Quality (AHRQ) has developed Prevention Quality Indicators (PQIs) that focus on inpatient Ambulatory Care Sensitive Conditions (ACSCs). An ACSC is a condition that could have been avoided or prevented from becoming more severe with proper ambulatory (e.g., outpatient or preventive) care (Agency of Healthcare Research and Quality [AHRQ], 2002). ACSCs offer a way for healthcare providers, researchers, and policy makers to measure the effectiveness of primary care over time, regions, demographic categories,

and providers (AHRQ, 2002). The AHRQ PQIs consist of 13 measures, including: diabetes short-term complication, perforated appendix, diabetes long-term complication, chronic obstructive pulmonary disease or asthma in older adults, hypertension, heart failure, low birth weight, dehydration, bacterial pneumonia, urinary tract infection, uncontrolled diabetes, asthma in younger adults, and lower-extremity amputation among patients with diabetes (AHRQ, 2002). These indicators allow identification of need levels, resources, and intervention progress monitoring (AHRQ, 2002).

Ambulatory care sensitive conditions and primary care. Literature surrounding ACSC hospitalizations indicates that most are due to lack of primary and preventive care. A systematic review of the relationship between primary healthcare and chronic disease ACSCs found that an increase in primary healthcare resulted in a significant decrease in ACSCs, even after controlling for health status (Gibson, Segal, & McDermott, 2013). Another review found that the relationship between primary care and ACSC hospitalizations varied geographically, with areas with more access to primary care resources having fewer ACSCs hospitalizations (Rosano et al., 2013), further strengthening the relationship between the two. This relationship between primary care and ACSCs is so strong that there have even been studies that use ACSC hospitalizations a markers of primary healthcare efficacy (Caminal, Starfield, Sanchez, Casanova, & Morales, 2004).

Disparities in ambulatory care sensitive conditions. As mentioned above, vulnerable populations often have poorer access to care and health outcomes than the general population. Existing literature suggests that vulnerable populations also have

higher rates of ACSCs. Johnson et al. found that ACSC ED visits were related to being female, a racial/ethnic minority, older, covered by public insurance, and from a low-income neighborhood (Johnson et al., 2012). In a study examining predictors of ACSC hospitalizations in South Carolina, minority, low-income, and rural populations experienced significantly higher rates ACSC hospitalizations (Shi, Samuels, Pease, Bailey, & Corley, 1999).

Race and ethnicity have shown to be predictors of greater amounts of preventable hospitalizations for some ACSCs, but not all (O'Neil et al., 2010). In regards to income, a study using data from a public hospital system in Texas found that lower-income zip codes were associated with higher rates of ACSCs (Djojonegoro, Aday, Williams, & Ford, 2000). Finally, a statistical brief on PQI rates using data from the Healthcare Cost and Utilization Project found that in 2005-2011, rural areas had much higher rates of PQIs than less urban areas (Torio & Andrews, 2006). Medicaid beneficiaries also experience disparities in ACSCs and preventable hospitalizations compared to privately insured individuals, which persist after controlling for ACSC-related disease prevalence and severity (Oster & Bindman, 2003). In sum, the vast majority of studies found that the disparities in ACSCs for both hospitalizations and ED visits were due to lack of adequate and ongoing primary care, even when other factors were considered (O'Neil et al., 2010; Shi et al., 1999).

The Impact of the Affordable Care Act

Access to care. The ACA, implemented in 2010, strives to increase insurance coverage to all Americans in an effort to reduce unnecessary illness and its associated cost. One way the ACA aims to do this is through the individual mandate, where all

individuals must obtain health insurance coverage by January 1, 2014, or face a tax penalty. Additionally, the ACA sets up state exchanges, where states must set up online shopping markets for individuals to shop for private insurance plans, which include subsidies for low-income individuals (between 100% and 400% Federal Poverty Level [FPL]), by January 1, 2014.

Coverage of preventive services. The ACA stipulates that all insurance plans must cover the United States Preventive Services Task Force (USPSTF) A and B level recommended preventive services at no cost sharing. This includes all individual private plans purchased from 2010 onward, as well as all private plans purchased through the exchanges, beginning in 2014. Studies have shown that among the privately insured, this preventive service coverage mandate had a positive effect on preventive services recommended on an annual basis (such as blood pressure check and flu shot) (Han, Robin Yabroff, Guy, Zheng, & Jemal, 2015), but had limited effect on cancer screenings, which are not recommended on an annual basis (Mehta et al., 2015).

Medicaid expansion. As part of the ACA, states were given the option to expand their Medicaid programs to cover all individuals, even childless adults, up to 138% of the FPL. All states who choose to expand their Medicaid programs must cover all USPSTF A & B level preventive services at no cost-sharing to the patient. Using the 2009 American Community Survey, it was estimated that 4.5 million uninsured American adults would be eligible for ACA Medicaid expansion (Kenney, Lynch, Haley, & Huntress, 2012). Considering that the national average of Medicaid coverage among those eligible is 67% and that there is state and demographic

variation in participation rates, high enrollment in Medicaid after expansion is key to improving health outcomes (Kenney et al., 2012). As of January 1, 2017, 32 states (including DC) opted to expand their Medicaid programs, and 19 states opted not to expand their Medicaid programs at this time (Kaiser Family Foundation [KFF], 2017a).

Effect of Medicaid eligibility levels. Lower Medicaid eligibility levels have been associated with poorer health outcomes and access to care. An analysis of Behavioral Risk Factor Surveillance System (BRFSS) 2010 data at the county level found that less generous Medicaid eligibility levels were associated with an increase in delayed care, and counties with higher rates of delayed care had higher minority populations, chronic disease prevalence, and lower incomes (Clark, Ommerborn, Coull, Pham, & Haas, 2013). This suggests that those Medicaid beneficiaries who live in states who have chosen not to expand Medicaid may need expanded access to care the most (low-income, minorities, and those with chronic conditions). Strengthening this argument for expansion, a study found that low-income adults in non-expansion states were less likely to have a usual source of care and more likely to be black and live in rural areas (Han, Nguyen, Drope, & Jemal, 2015).

Previous Medicaid expansions. Several states have expanded their Medicaid programs in the past, which allows researchers to evaluate the effects of such expansions. In 2008, Oregon selected low-income, uninsured individuals by lottery to be part of their Medicaid program (Finkelstein et al., 2012a). During the first year of the Oregon Health Insurance Experiment, those who became eligible for Medicaid had higher utilization of healthcare, lower out-of-pocket costs and medical debt, and

better self-reported health, both mental and physical, than the control group (Finkelstein et al., 2012b). The Oregon Medicaid expansion also resulted in higher rates of cancer screenings and better primary care and self-reported health outcomes (Wright et al., 2016). Similarly, after Arizona's Medicaid expansion in 2001, Medicaid beneficiaries were more likely to have visited a provider during the last year, to have a usual source of care, to have been screened for diabetes and/or hypertension, and were less likely to see a provider in Mexico or delay care (Langellier, Guernsey de Zapien, Rosales, Ingram, & Carvajal, 2014).

Although contested, most literature on the effect of Medicaid eligibility consistently shows positive outcomes associated with expansion, including reductions in poor health outcomes, preventable hospitalizations (Kaestner, Joyce, & Racine, 2001; Ndumele, Mor, Allen, Burgess, & Trivedi, 2014), delayed healthcare (Sommers, Baiker, & Epstein, 2012), and mortality (Sommers, Baiker, & Epstein, 2012), as well as increases in coverage (Sommers, Baicker, & Epstein, 2012), self-reported health (Sommers et al., 2012), and cancer screenings (Sabik, Tarazi, & Bradley, 2015).

Potential Cost Saving of Medicaid Expansion. Medicaid expansion also provides a potential opportunity to save money for the federal government, states, and individuals in the long run. In a study examining the potential effects opting out of Medicaid expansion, it was found that opting out of Medicaid expansion by the 14 states whose governors chose not to expand Medicaid would result in 3.6 million less people insured, $8.4 billion less federal transfer payments, and $1 billion more spending on uncompensated care (Price & Eibner, 2013). Frakt and Carroll argue that

Medicaid expansion is a win, win, win situation: patients win by getting coverage, providers win by not having to eat the cost of uncompensated care, and states win by not having to cover as much uncompensated care (Frakt & Carroll, 2013).

Effects to Date of the Affordable Care Act

As of early 2016, the ACA has increased health insurance coverage by 20 million people (DHHS, 2016b). This includes a 43% decrease in the rate of uninsured non-elderly adults (aged 18-64) from October 2013, to early 2015 (DHHS, 2016b). The ACA has also increased utilization of some preventive services. As of May 2015, it is estimated that 137 million Americans now have access to preventive services at no cost-sharing (DHHS, 2015b), and it is estimated that in 2014, 76 million individuals (including 30 million women) received expanded coverage of at least one preventive service thanks to the ACA (DHHS, 2014b).

Regarding results to date of the Medicaid expansion portion of the ACA, the full implementation of the ACA resulted in an increase in coverage of 5.9 percentage points in expansion states, versus 2.8 percentage points in non-expansion states (Courtemanche, Marton, Ukert, Yelowitz, & Zapata, 2017). This increase in coverage was for both newly eligible and previously eligible individuals, and there was not found to be significant decrease in private insurance coverage (Frean, Gruber, & Sommers, 2017). Medicaid expansion also resulted in an increase in coverage in rural areas (Soni, Hendryx, & Simon, 2017). It is estimated that, in the states who chose to opt-out of the Medicaid expansion, the decision to opt-out will result in about 7,000-16,000 additional deaths, compared to if all states opted-in to the expansion (Dickman, Himmelstein, McCormick, & Woolhandler, 2015). Among low-income

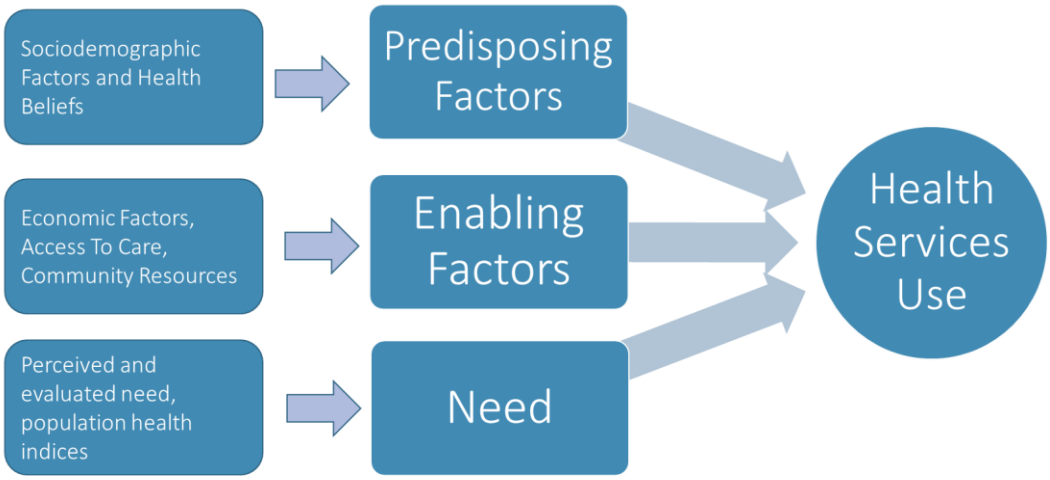
populations, Medicaid expansion was associated with increased insurance coverage overall, quality of coverage, utilization, and diagnosis of chronic diseases (Wherry & Miller, 2016).

Conceptual Framework

My dissertation research is grounded in the Andersen Behavioral Model of Health Services Use. The Andersen Model incorporates both individual and contextual factors into a conceptual framework that aims to explain the complex and multidimensional factors that influence the use of health services (Andersen & Davidson, 2001). Factors influencing health services use are divided into three main categories in the model: predisposing factors, enabling factors, and need factors (See Figure 1.1). Predisposing factors are demographic, social, and mental factors, such as age, race, education level, and health beliefs that can influence the use of health services (Andersen & Davidson, 2001). Contextual factors, such as cultural norms and political perspectives, can also be considered predisposing factors (Andersen & Davidson, 2001). Next, enabling factors are financial and organizational factors that influence an individual's ability to access health services (Andersen & Davidson, 2001). Individual-level examples include income, insurance coverage, having a usual source of care, and having means of transportation (Andersen & Davidson, 2001). At the contextual-level, enabling factors include average community income and availability of health resources in the community (Andersen & Davidson, 2001). Lastly, individual-need factors include both perceived and evaluated need, and contextual-level need factors include environmental needs and population health indices (Andersen & Davidson, 2001). These factors influence and interact with one

another to determine whether an individual will utilize healthcare services. For example, a pregnant woman with a moderate income and health insurance coverage would probably be more likely to use healthcare services overall. However, if said woman lived in an area with few healthcare providers, she may be less likely to use health services.

Figure 1.1: The Andersen Behavioral Model of Health Service Use



Note: Author's adaptation of original model.

My dissertation studies focus specifically on enabling factors associated with healthcare services use. By focusing on increased access to health insurance under the ACA, I attempt to examine the effect of this specific enabling factor on the utilization of preventive services. Additionally, my research focuses on vulnerable populations, which highlight both predisposing (race, ethnicity, and education) and enabling (income and type of insurance coverage) factors that can affect utilization of preventive services. I also control for other predisposing, enabling, and need factors in my models when the data permit.

DISSERTATION SUMMARY

Study 1 (Chapter 2): Preventive Service Use among Vulnerable Populations: Evidence after the Full Implementation of the Affordable Care Act

In my first study (Chapter 2), I used national-level data from the National Health Interview Survey (NHIS) from 2011-2015 to examine 1) whether there are disparities in utilization of preventive services among vulnerable populations, 2) whether the full expansion of the ACA in 2014 was associated with a change in utilization patterns of preventive services among vulnerable populations, and 3) whether having an insurance plan purchased through the exchanges set up by the ACA was associated with the odds of utilization of preventive services among the privately insured after the full implementation of the ACA in 2014. The results of this study indicate that expanded access from the ACA alone may not be enough to ensure increased utilization of preventive services, especially among vulnerable populations. Efforts to increase knowledge of the expanded access to insurance coverage available through the ACA, as well as how to navigate the healthcare system and what preventive service are recommended when and for whom could help increase utilization of preventive services.

Study 2 (Chapter 3): Variation of Preventive Service Utilization by State Medicaid Coverage and Cost Sharing Policies and Medicaid Expansion Status

In my second study (Chapter 3), I used state-level Medical Expenditure Panel Survey (MEPS) data (2009-2014) and Kaiser Family Foundation Medicaid Policy Data (2010 and 2013) to evaluate the effect of both Medicaid expansion and state Medicaid policies on the utilization of preventive services among Medicaid beneficiaries, including vulnerable populations. I hypothesized that 1) Medicaid

coverage of preventive services would be associated with an increase in the odds of utilization of preventive services, 2) Medicaid beneficiary copay for preventive services would be associated with a decrease in the odds of utilization of preventive services, 3) Medicaid expansion in 2014 under the ACA would be associated with an increase in the odds of utilization of preventive services, and 4) Medicaid expansion would be associated with a reduction in disparities in the odds of utilization of preventive services among vulnerable populations. I used multivariable logistic regression models, as well as difference-in-differences and difference-in-difference-in-differences linear probability models to evaluate these hypotheses. The results of this study indicate that, although Medicaid coverage of flu shot was associated with an increase in utilization, Medicaid expansion did significantly effect utilization of preventive services and did not have many significant effects on disparities in utilization of preventive services among vulnerable populations. This again stresses the importance of education and knowledge of how to navigate the healthcare system in the utilization of preventive services among vulnerable populations.

Study 3 (Chapter 4): Effect of Primary Care Utilization on Potentially Preventable Hospitalizations – Evidence from the Maryland Medical Care Database

In my third study (Chapter 4) I used the Maryland Medical Care Database (2012-2014), which includes information on all healthcare utilization for the commercially insured in the state of Maryland, zip code-level population characteristics from the American Community Survey (2013), and county-level characteristics from the Area Health Resources File (2012) to evaluate the effect of primary care utilization on the odds of having 1) a potentially preventable

hospitalization among those with any hospitalizations, 2) any hospitalization and a potentially preventable hospitalization among the overall population. The results of this study reinforce the importance of primary care in general, and particularly continuity in primary care, in avoiding both hospitalizations in general and potentially preventable hospitalizations.

CONCLUSION

My dissertation focuses on how healthcare policy can influence both access to and utilization of preventive services, especially among vulnerable populations, as well the importance of continuity in primary care in avoiding potentially preventable hospitalizations and how area characteristics can play an important role in this relationship. The ACA has increased access to healthcare for millions of Americans. However, literature to date does not show a significant association with the ACA and utilization of some types preventive services, including among vulnerable populations. By using new and robust data and analyses, my dissertation fills in many gaps in the existing literature surrounding the effects of the ACA on utilization of preventive services and the importance of ongoing primary care, especially among vulnerable populations. The results of my studies also point to several important policy implications that could help improve utilization of preventive services and reduce the burden of chronic conditions, especially among vulnerable populations.

First, most studies examining the effect of the ACA to date look at only the effect of overall utilization of primary care and/or preventive services or overall access to healthcare for vulnerable populations. To my knowledge, no studies to date examine the effect of the ACA on access to preventive services among vulnerable

populations specifically. Second, no studies to my knowledge to date examine the effect of specific Medicaid policy on coverage of and copay for preventive services on utilization of said preventive services. Next, although there is a study examining the effect of Medicaid expansion on utilization of preventive services, the study has several limitations that I attempt to control for in my analyses, including examining effects among vulnerable populations. Finally, although there is an abundance of literature examining the relationship among primary care and potentially preventable hospitalizations, few studies use all payer data to examine this relationship, and to my knowledge, no studies to date are able to control for a lag in utilization of primary care.

Chapter 2: Preventive Service Use Among Vulnerable Populations: Evidence after the Full Implementation of the Affordable Care Act

INTRODUCTION

Chronic Diseases and Preventive Services

Chronic diseases are the leading cause of morbidity and mortality in the United States and can result in high levels of healthcare expenditures. In 2010, chronic diseases accounted for 70% of causes of death in the United States (CDC, 2014), and in 2012, approximately 50% of adults (117 million people) had at least one chronic disease (Ward, Schiller, & Goodman, 2014). Chronic disease related illnesses made up 86% of all healthcare expenditures in 2010 (Gerteis et al., 2014), and healthcare expenditures accounted for 17.4% of Gross Domestic Product spending in the United States in 2013 (Hartman, Martin, Lassman, & Catlin, 2015).

Access to primary care and preventive services can potentially help curb the cost associated with chronic disease (CDC, 2013). Early screening and detection can prevent chronic diseases from worsening and sometimes from occurring all together, which could help curb the costs associated with chronic conditions in some cases (CDC, 2013). It is estimated that if more people utilized preventive services, two million life years could be saved annually (Maciosek, Coffield, Flottemesch, Edwards, & Solberg, 2010). Specifically, it is estimated that14,000 lives could be saved each year if the percentage of adults receiving adequate colorectal cancer screening preventive services increased to 90%, and 3,700 lives could be saved each year if the percentage of women receiving adequate breast cancer screenings increased to 90% (Robert Wood Johnson Foundation [RWJF], 2007). However, in

the US, only about 3 cents of every dollar are spent on prevention (Kemp et al., 2012).

The Affordable Care Act, Access to Care, and Vulnerable Populations

Often, many people who need preventive care do not have timely access to preventive care or simply cannot afford it (Cheung, Wiler, Lowe, & Ginde, 2012; Meissner, Klabunde, Breen, & Zapka, 2012). The ACA strives to increase access to preventive services for all Americans in an effort to reduce unnecessary illness and its associated costs. The ACA aims to achieve this goal in several ways. One way is through the individual mandate, where all individuals must obtain health insurance coverage by January 1, 2014, or face a tax penalty. Additionally, the ACA sets up state exchanges, where states must set up online shopping markets for individuals to shop for private insurance plans, which include subsidies for low-income individuals (between 100% and 400% Federal Poverty Level [FPL]), by January 1, 2014. Another way the ACA aims to increase access to care and preventive services is through the Medicaid expansion, where states are given the option to expand their Medicaid programs to everyone up to 138% FPL beginning January 1, 2014. Finally, the ACA stipulates that all insurance plans must cover the United States Preventive Services Task Force (USPSTF) A and B level recommended preventive services at no cost sharing. This includes all individual private plans purchased through the exchanges, all Medicaid beneficiaries newly covered under the Medicaid expansions, and all other private insurance plans starting in 2010.

As of early 2016, the ACA has increased health insurance coverage by 20 million people (United States Department of Health and Human Services [DHHS],

2016a). This includes a 43% decrease in the rate of uninsured non-elderly adults (aged 18-64) from October 2013, to early 2015 (DHHS, 2016a). The ACA has also increased utilization of some preventive services. As of May 2015, it is estimated that 137 million Americans now have access to preventive services at no cost-sharing (DHHS, 2015b), and it is estimated that in 2014, 76 million individuals (including 30 million women) received expanded coverage of at least one preventive service thanks to the ACA (DHHS, 2014b). Specifically, blood pressure check, cholesterol check, and flu shot utilization significantly increased from 2009 to 2011-2012 (Han, Robin Yabroff, Guy, Zheng, & Jemal, 2015). However, few changes have been observed in cancer screenings, which are not recommended on an annual basis, since the expansion of coverage under the ACA (Mehta et al., 2015).

The ACA's efforts to expand access to care include aspects that focus specifically on increasing access to care for vulnerable populations. Vulnerable populations include racial and ethnic minorities, economically disadvantaged individuals, individuals who are seriously ill, and institutionalized individuals (National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, 1979). The economically disadvantaged include those with low incomes and low levels of education.

Economically disadvantaged populations have been shown to have poorer access to preventive services than high-income populations. For example, a study of the utilization of six preventive services (HIV test, smoking cessation discussion, flu shot, pneumococcal vaccination, tetanus vaccination, and zoster vaccination) using NHIS data from 2011-2012 found that those with income >200% FPL were more

likely to receive all services but HIV test (Fox & Shaw, 2014). A similar study examining blood pressure screening, cholesterol screening, colon cancer screening, diet counseling, blood sugar check, hepatitis A vaccination, hepatitis B vaccination, mammogram, and pap smear found that those with incomes >200% FPL were significantly more likely to receive all services, except for hepatitis A vaccination (Fox & Shaw, 2015). Individuals with low levels of education experience poorer access to some preventive services as well. In a study using MEPS data to assess factors associated with first time receipt of preventive services, it was found that higher education levels were associated with receipt of blood pressure check, cholesterol check, colonoscopy, flu shot, and routine physical, but were not associated with mammogram, pap smear, or clinical breast examination (Gai & Feng, 2013).

Another goal of the ACA is to reduce racial and ethnic health disparities. Racial and ethnic minorities face substantial disparities in access to care and health outcomes. Non-Latino Blacks (DHHS, 2016b), Asians (DHHS, 2014a), and Latinos (DHHS, 2015a) have lower rates of health insurance and experience higher rates of morbidity and mortality than non-Latino Whites. Research has shown evidence that ACA can reduce health disparities (Chen et al., 2016). On the other hand, research has also shown that minorities often have higher rates of preventive service utilization than non-Latino Whites (Holden, Chen, & Dagher, 2015). No studies to my knowledge examine the effect of the ACA on disparities in preventive services utilization among vulnerable populations.

Study Objectives

The objectives of this study are to 1) examine whether utilization patterns of preventive services vary among vulnerable populations, such as low-income, low-education, and racial and ethnic minority groups, 2) assess whether utilization patterns in preventive services among vulnerable populations have changed after the full implementation of the ACA in 2014, and 3) examine whether utilization patterns of preventive services varied by whether or not a plan was purchased through a state exchanges among the privately insured in 2014 and 2015.

I hypothesize that the full implementation of the ACA will decrease disparities in preventive services in vulnerable populations. I believe that the increase in coverage and access to care achieved through the ACA will result in more individuals in vulnerable populations acquiring insurance coverage, including individuals with low-income and education levels and racial and ethnic minorities. This increase in coverage will lead to more access to and utilization of preventive services, which will then decrease disparities in utilization patterns of preventive services by income, education, and race and ethnicity.

In addition, I hypothesize that individuals with plans purchased through the state exchanges set up by the ACA will have higher utilization rates of preventive services, compared to those with private insurance not purchased through the exchanges, including employer sponsored plans and individual policies not purchased through the exchanges. All plans purchased through the exchanges must cover USPSTF A and B level preventive services at no cost sharing, which I hypothesize will lead to an increase in utilization rates. Specifically, since many individuals

purchasing coverage through the exchanges are previously uninsured, it is possible that they have been putting off receiving their recommended preventive services due to cost. Now that they have insurance coverage through the exchanges, with no cost sharing for recommended preventive services, it is likely that they will use more preventive services than those who have private coverage plans not purchased through the exchanges, even if those plans were included in the ACA provision that mandates all private plans cover preventive services at no cost sharing beginning in 2010.

METHODS

Data

I use data from the National Health Interview Survey (NHIS) from 2011 – 2015. The NHIS has been conducted by the National Center for Health Statistics for over 50 years to monitor both the rates of illness and disability in the United States and the progress of national health objectives (CDC, 2016). NHIS includes variables on a wide variety of health topics, including access, utilization, and financing.

Dependent Variables

My dependent variables of interest were whether respondents received seven preventive services during the past 12 months: 1) mammogram, 2) pap smear, 3) colon cancer screening, 4) flu shot, 5) blood pressure check, 6) blood sugar check, and 7) cholesterol check. I constructed dummy variables for each preventive service comparing those who were eligible (according to the USPSTF guidelines, outlined in more detail below) and did receive said service to those who were eligible and did not receive said service.

Key Independent Variables

Since my objectives include evaluating any change in preventive service use by income, education, or race/ethnicity, I constructed corresponding variables for each of these vulnerable populations of interest. First, I constructed an income variable (poor [<10k annual income]*[1] versus low-income [10-19k annual income], medium income [20-44k annual income], and high income [>=45k annual income]). Next, I constructed an education variable (less than high school education* versus high school diploma or GED, some college, associates degree, bachelors degree, masters degree, and doctoral or professional degree). Finally, I constructed a categorical race and ethnicity variable (non-Latino Whites* versus non-Latino Blacks, Asians, and Latinos).

To assess the association of the full implementation of the ACA on preventive service utilization, I constructed a post-ACA indicator variable (2011-2013* versus 2014 and 2015). Then, to evaluate change in preventive services utilization in vulnerable populations after the full implementation of the ACA, I constructed interaction terms of the post-ACA indicator variable with income, education, and race/ethnicity variables. I chose 2014 as the cut off point for my post-ACA variable, because most of the major provisions of the ACA that I hypothesize will affect utilization rates of preventive services went into effect on January 1, 2014, including the individual mandate, state exchanges, and Medicaid expansion.

Lastly, to assess preliminary evidence of any association between plans purchased through the ACA exchanges on utilization of preventive services among

[1] * indicates reference group

the privately insured in 2014 and 2015, I constructed an exchange indicator variable (non-exchange plans* versus exchange plans), where private plans not purchased through the exchanges include employer sponsored or self-pay individual private plans.

Other Independent Variables

In my adjusted models, I control for a variety of demographic, socioeconomic, health status, and health access variables. Demographic variables include age (in years), sex (male* versus female), citizenship (US citizen* versus non-US citizen), and region (Northeast* versus Midwest, South, and West). Socioeconomic variables include employment (unemployed for the past 12 months* versus employed for 2-6 of the past 12 months, employed 7-11 of the past 12 months, and employed for the past 12 months). Health status variables include self-reported health status (poor, fair, or good health* versus very good or excellent health) and number of chronic conditions (no chronic conditions* versus one chronic conditions, 2-3 chronic conditions, 4-5 chronic conditions, and 5+ chronic conditions). Health access variables include insurance coverage (uninsured* versus private insurance, Medicare, Medicaid, and other insurance type).

Sample

Sample sizes varied for each preventive service, since eligibility for each service varied by individuals in my sample. I based my variables on USPSTF guidelines (USPSTF, 2016). USPSTF recommends that colon cancer screening be performed on all adults starting at age 50 and continuing until age 75 (n=65,754);

cholesterol screening be performed on males beginning at age 35 and females beginning at age 45 (n=106,537); blood sugar screening be performed on all adults (n=167,847); blood pressure screening be performed on all adults (n=168,794); breast cancer screening (mammogram) be performed on women 50 to 74 years (n=50,058); and cervical cancer screening (pap smear) be performed on women 21 to 65 years (n=69,264). The CDC recommends that everyone has a flu shot (n=169,369) (Grohskopf et al., 2016).

Analysis

First, to examine the characteristics of my sample, I performed univariate analyses of each variable. I then used multivariable logistic regression models to evaluate disparities in preventive services among vulnerable populations. Model 1 is a logistic regression model that corresponds to my first research objective, which is to examine whether there are different utilization patterns of preventive services among vulnerable populations. In Model 1, I control for income, education, and race and ethnicity, as well as demographic, socioeconomic, geographic, health access, and health status variables. To evaluate my second research objective, whether utilization patterns in preventive services among vulnerable populations have changed after the full implementation of the ACA in 2014, I used Model 2, a logistic regression model which also includes an interaction term between each vulnerable population variable and a post-ACA indicator variable. Finally, for my third research objective, to examine whether utilization patterns of preventive services varied by exchange plan status among the privately insured in 2014 and 2015, I used Model 3, which is a

logistic regression model that includes all the variables from Model 1, except for insurance coverage, plus an exchange plan indicator variable.

I used Stata 14 to perform all analyses, and I used the *svy* commands to obtain population estimates. The NHIS randomly selects a small sample of the US population for their surveys, which means that performing analyses on only this sample could result in estimation bias, especially when attempting to generalize results to the entire US population. To account for this bias, NHIS also includes probability weights, strata, and sampling units for each record to allow for more robust population estimates based on the sample. The Stata *svy* commands are a set of commands that allow researchers to obtain estimates using complex survey design data, such as NHIS. I used the *svyset, svy: tab, svy: proportion (lincom), svy: logit,* and *svy: reg* commands to conduct my analyses based on the complex survey design of NHIS.

RESULTS

Population Characteristics

In total, my population was 62% non-Latino White, 14.57% non-Latino Black, 6.01% Asian, and 17.42% Latino. Fifty-five percent were female, 55.63% had less than a college degree, 27.8% were unemployed for at least one month out of the last 12 months, 30.45% were poor or low income, and 90.65% were US citizens. Fifty-seven percent reported excellent or good health, and 57.79% had private health insurance. Interestingly, those in post-ACA years (2014-2015) had significantly lower utilization rates of all preventive services aside from mammogram, compared to those in pre-ACA years (2011-2013; See Figure 2.1).

Model 1: Logistic Regression Examining the Utilization of Preventive Services

Model 1 suggests that post-ACA, utilization increased for flu shot (OR = 1.13, $p < 0.001$), blood pressure check (OR = 1.2, $p < 0.001$), and cholesterol check (OR = 1.14, $p < 0.001$) (See Table 2.1). Yet, utilization decreased post-ACA for blood sugar check (OR = 0.74, $p < 0.001$), colon cancer screening (OR = 0.87, $p < 0.001$), mammogram (OR = 0.91, $p < 0.05$), and pap smear (OR = 0.78, $p < 0.001$).

I also found several interesting trends in utilization of preventive services by income, education, and race/ethnicity. In terms of income, compared to poor individuals, individuals with low incomes were less likely to receive flu shot (OR = 0.88, $p < 0.01$) and blood pressure check (OR = 0.83, $p < 0.01$). Those with medium incomes were more likely to receive blood sugar check (OR = 1.19, $p < 0.001$), cholesterol check (OR = 1.18, $p < 0.05$), and pap smear (OR = 1.32, $p < 0.001$), and those with high incomes were more likely to receive all services, except flu shot.

For education, compared to those with no high school degree, those with a high school degree or GED were significantly more likely to receive blood pressure check (OR = 1.24, $p < 0.001$) and cholesterol check (OR = 1.22, $p < 0.001$). Those with some college, an associates degree, a bachelors degree, and a doctoral or professional degree were significantly more likely to receive all services, except for colon cancer screening. Those with a masters degree were significantly more likely to use all preventive services.

In terms of race, non-Latino Blacks were more likely than non-Latino Whites to receive all preventive services (colon cancer screening [OR = 1.46, $p < 0.001$], blood pressure check [OR = 1.1, $p < 0.05$], blood sugar check [OR = 1.22, $p < 0.001$],

cholesterol check [OR = 1.37, $p < 0.001$], mammogram [OR = 1.16, $p < 0.05$], pap smear [OR = 1.52, $p < 0.001$]), except flu shot, which non-Latino Blacks were less likely to receive than non-Latino Whites (OR = 0.78, $p < 0.001$). Asians were more likely than non-Latino Whites to receive a flu shot (OR = 1.28, $p < 0.001$), blood sugar check (OR = 1.32, $p < 0.001$), and cholesterol check (OR = 1.28, $p < 0.001$) and less likely than non-Latino Whites to receive blood pressure check (OR = 0.76, $p < 0.001$) and pap smear (OR = 0.71, $p < 0.001$). Latinos were more likely than non-Latino Whites to receive colon cancer screening (OR = 1.16, $p < 0.05$), blood sugar check (OR = 1.43, $p < 0.001$), cholesterol check (OR = 1.3, $p < 0.001$), mammogram (OR = 1.31, $p < 0.01$), and pap smear (OR = 1.12, $p < 0.05$) and less likely than non-Latino Whites to receive a blood pressure check (OR = 0.89, $p < 0.01$).

In terms of control variables, age was significantly positively associated with colon cancer screening, flu shot, blood pressure check, blood sugar check, and cholesterol check, and it was negatively associated with pap smear. Those with private health insurance, Medicare, and Medicaid were significantly more likely to receive a flu shot and cholesterol check than the uninsured. Privately insured individuals were also significantly more likely to receive mammogram than the uninsured, and Medicaid beneficiaries were significantly more likely to receive pap smear than the uninsured. Compared to those with poor, fair, or good self-reported health status, those with very good or excellent self-reported health status were significantly more likely to receive mammogram and pap smear and significantly less likely to receive cholesterol check. Those with any chronic conditions were significantly more likely to receive cancer screening, flu shot, blood pressure check,

blood sugar check, and cholesterol screening, compared to those with no chronic conditions. Additionally, those with 1-4 chronic conditions were significantly more likely to receive mammogram, compared to those with no chronic conditions, and those with one chronic condition were significantly more likely to receive pap smear, compared to those with no chronic conditions. US citizenship was significantly associated with receiving a flu shot, blood pressure check, and pap smear.

Model 2: Logistic Regression Examining the Association between the ACA and Utilization of Preventive Services among Vulnerable Populations

In Model 2, I used adjusted logistic regression models, controlling for demographic, socioeconomic, geographic, health status, and health access variables, plus an interaction term between vulnerable populations (income, education, and race/ethnicity) and a post-ACA indicator variable to evaluate whether the full implementation of the ACA was associated with utilization patterns of preventive services among vulnerable populations.

In Model 2a, examining the association of the ACA with preventive service utilization patterns among income groups, I found that the ACA was associated with a decrease in utilization of mammograms for low-income (OR = 0.67 $p < 0.05$), medium-income (OR = 0.71, $p < 0.05$, and high-income (OR = 0.72, $p < 0.05$) individuals (See Table 2.2). Additionally, the ACA was associated with a decrease in the odds of receiving blood pressure check (OR = 0.82, $p < 0.05$).

Model 2b, which examines the association of the ACA with preventive service utilization among education levels, found that the ACA was associated with an increase in the utilization of flu shot for those with a high school diploma or GED

(OR = 1.21, $p < 0.05$), a bachelors degree (OR = 1.28, $p < 0.01$), and a masters degree (OR = 1.31, $p < 0.01$).

Finally, in my Model 2c, which examines the association of the ACA with preventive service utilization among race and ethnicity, the ACA was associated with an increase in utilization of cholesterol checks (OR = 1.22, $p < 0.05$) and mammograms (OR = 1.42, $p < 0.05$) for non-Latino Blacks, and an increase in utilization of mammograms for Asians (OR = 1.71, $p < 0.05$). I observed no significant association with the ACA and changes in utilization of preventive services for Latinos. For Model 2 control variables, I observed similar trends to Model 1 control variables, except I also saw that having very good or excellent self-reported health status was significantly negatively associated with receiving blood sugar check.

Model 3: Logistic Regression Examining the Association between Exchange Plans and the Utilization of Preventive Services among the Privately Insured

In Model 3, after controlling for demographic, socioeconomic, geographic, health status, and health access variables, having insurance through exchanges was significantly associated with a decrease in the odds of utilization of all preventive services except blood sugar check (See Table 2.3: colon cancer screening [OR = 0.65, $p < 0.05$], flu shot [OR = 0.58, $p < 0.001$], blood pressure check [OR = 0.56, $p < 0.001$], cholesterol check [OR = 0.70, $p < 0.01$], mammogram [OR = 0.52, $p < 0.001$], pap smear [OR = 0.78, $p < 0.01$]), compared to the privately insured whose individual plans were not purchased through the exchanges. Model 3 control variables were similar to Model 1 control variables as well, except that having excellent or very good

self-reported health was significantly negatively associated with receiving blood sugar check, and there was no association with cholesterol check.

In terms of vulnerable populations, those with low-income were significantly less likely to receive flu shot and blood pressure check compared to poor individuals. Those with medium-income were significantly more likely to receive a pap smear, and those with high-income were significantly more likely to receive blood sugar check, cholesterol check, and pap smear. For education, those with a high school degree or higher were significantly more likely to receive a cholesterol check. Those with a college degree or higher were more likely to receive all services, except colon cancer screening. Race and ethnicity was significantly associated with all services. Non-Latino Blacks were significantly more likely to receive colon cancer screening, blood sugar check, cholesterol check, mammogram, and pap smear than non-Latino Whites and significantly less likely to receive a flu shot. Asians were significantly more likely to receive a flu shot, blood sugar check, and cholesterol check than non-Latino Whites and significantly less likely to receive blood pressure check and pap smear. Latinos were significantly more likely to receive blood sugar check, cholesterol check, and pap smear than non-Latino Whites.

DISCUSSION

Model 1 suggests that the full implementation of the ACA in 2014 was associated with an increase in utilization of flu shot, blood pressure check, and cholesterol check. However, the full implementation of the ACA was associated with a decrease in utilization of blood sugar check, colon cancer screening, mammogram, and pap smear. These findings are similar to findings from previous studies

examining the effects of the ACA on preventive service utilization, which found that utilization increased post-ACA for preventive services recommended on an annual basis (Han et al., 2015), but not for cancer screenings, which are recommended less frequently (Mehta et al., 2015). These results could be due to not enough time having passed since the full implementation of the ACA in 2014 to see effects on preventive services that are recommended on a less than annual basis.

My Model 1 results indicated that there are disparities in preventive service utilization among vulnerable populations. Except for low-income individuals being less likely than poor individuals to receive flu shot and blood pressure check, medium- and high-income individuals were more likely than poor individuals to receive nearly all preventive services, indicating that higher income is associated with higher utilization of preventive services. Model 1 suggested that those with higher incomes may have better access to services than those with lower incomes. This could be due to higher incomes being more likely to be insured by both individual and employer sponsored plans (Woolf, et al., 2015). Interestingly, low-income individuals were less likely than poor individuals to receive flu shot and blood pressure check. This could be because poor individuals are more likely to be in the coverage gap, which means their incomes are not low enough to qualify for state Medicaid programs, but their incomes are not high enough to afford individual insurance plans (Garfield & Damico, 2016). This supported my finding that those with Medicaid were more likely than the uninsured to receive flu shot, cholesterol check, and pap smear. Low-income individuals are also less likely to have access to employer sponsored insurance and are therefore more likely to be uninsured (Woolf, et al., 2015). This is

especially pertinent to flu shot. Although flu shots are widely available in the community, they often cost about $30, which could be a significant barrier to low-income individuals who fall into the coverage gap. Poor individuals may also be more likely to receive free healthcare through community organizations and safety net facilities, like church health centers or federally qualified health centers (Nguyen, Makam, & Halm, 2016). Finally, low-income adults may not be aware of the new ways to obtain coverage through the ACA. A study found that only about half of low-income adults in Arkansas, Kentucky, and Texas had even heard of the coverage expansions available through the ACA (Sommers, Maylone, Nguyen, Blendon, & Epstein, 2015).

I saw a similar trend to income in education, where the higher the education level, the more likely an individual is to receive most preventive services. My results support previous findings that educational level is significantly associated with increased access to and utilization of healthcare overall (Zimmerman, Woolf, & Haley, 2015), and some preventive services specifically (Gai & Feng, 2013). This trend is most likely because education level is positively associated with income. Those with higher education levels are more likely to get better paying jobs and therefore have more access to services, as previously discussed.

In terms of race, non-Latino Blacks were more likely than non-Latino Whites to receive all preventive services, except flu shot, which non-Latino Blacks were less likely to receive. Asians were more likely than non-Latino Whites to receive a flu shot, blood sugar check, and cholesterol check and less likely than non-Latino Whites to receive blood pressure check and pap smear. Latinos were more likely than non-

Latino Whites to receive colon cancer screening, blood sugar check, cholesterol check, mammogram, and pap smear and less likely than non-Latino Whites to receive a blood pressure check. These findings are similar to previous studies that have found that minorities are often more likely to receive preventive services than non-Latino Whites (Holden et al., 2015).

Since the ACA contains many components to increase access to care to vulnerable populations, I hypothesized that these disparities in preventive service use would diminish after the full implementation of the ACA in 2014. However, my Model 2 results suggest that the full implementation of the ACA in 2014 was not associated with many changes in the utilization patterns of preventive services among vulnerable populations. In my Model 2a, examining the association of the full implantation of ACA with preventive service utilization patterns among income groups, I found that the ACA was associated with a decrease in the utilization of mammograms and blood pressure checks for those with higher incomes. These findings support my hypothesis that lower individuals gained more access to services after the full implementation of the ACA, which in turn led to an increase in utilization of mammograms and blood pressure checks for poor individuals. I did not see any significant associations between the full implementation of the ACA and utilization of the other five preventive services analyzed among income groups.

Model 2b, which examines the association of the full implementation of the ACA and preventive service utilization among education levels, I found that the ACA was associated with an increase in utilization of flu shot for those with a high school education or higher. I found no other significant interaction terms for any of the other

preventive services. These finding suggest that the ACA was not significantly associated with the utilization patterns of most preventive services among education groups. Since I did see a couple of interaction effects among income groups, one would expect to see similar trends among education groups, but this was not the case.

Finally, in my Model 2c, which examines the association of the full implantation of the ACA and preventive service utilization among race/ethnicity, the AC was associated with an increase in utilization of mammograms for non-Latino Blacks and Asians, and an increase in utilization of cholesterol checks for non-Latino Blacks. I observed no significant association between the ACA and changes in utilization of preventive services for Latinos. In Model 1, without interaction terms for pre/post-ACA, I found that non-Latino Blacks were more likely than non-Latino Whites to receive all services except flu shot, Latinos were significantly more likely than non-Latino Whites to receive all services except flu shot and blood pressure check, and Asians were more likely than non-Latino Whites to receive flu shot, blood sugar check, and cholesterol check. When I added the post-ACA interaction term in Model 2, I saw fewer associations, indicating that the full implementation of the ACA in 2014 was not strongly associated with utilization patterns of preventive services among minorities. This is interesting, since the ACA aims to reduce racial and ethnic disparities in care, which includes Latinos. These results could be explained by low awareness levels of the ACA among minorities. For example, a study found that Hispanics have lower awareness of the ACA (Garcia Mosqueira, Hua, & Sommers, 2015).

The results from my interaction terms in Model 2 did not fully support my hypothesis that the ACA would result in increased utilization of preventive services among vulnerable populations. I hypothesized that people with lower income and education levels would be more likely to utilize preventive services after the full implementation of the ACA, due to the efforts of the ACA to increase insurance coverage to lower income individuals. I did see this trend among mammograms and blood pressure check, but I saw no other significant negative interaction effects among income. I even saw significant positive interactions effects among education for flu shot. This is surprising since the ACA has many specific measures put in place to expand service to low income individuals, such as the optional expansion of state Medicaid programs to cover all individuals (even childless adults) up to 138% FPL and the premium subsidies available for people shopping for individual coverage on the exchanges and whose incomes are between 100% and 400% FPL. Many states chose not to expand their Medicaid programs though, leaving a significant portion of low-income and childless adults without coverage. Additionally, since the premium subsidies on the exchanges start at 100% FPL, many individuals are still left without coverage in states like Texas and Alabama, whose Medicaid eligibility thresholds are far below 100% FPL and chose not to expand Medicaid through the ACA (KFF, 2017a; KFF, 2017b).

To explain why I did not see the expected effects in my Model 2, I used Model 3 to examine utilization of preventive services among the privately insured in 2014 and 2015, controlling for whether an individual's insurance plan was purchased through the exchanges. Model 3 suggested that in 2014 and 2015, having private

insurance coverage through the exchanges was significantly associated with lower utilization rates of preventive services, compared to those who have non-exchange private coverage. Although consistent with some of my findings in Model 2, this was still surprising, given that I hypothesized that increase access to insurance coverage would increase utilization of preventive services.

This discrepancy could be due to several reasons. First, many people who are purchasing plans through the exchange were previously uninsured (Hamel, et al., 2014). People who have never had insurance before often do not know how to navigate the healthcare system, whether that is finding a primary care doctor, scheduling an appointment, or knowing when to go to the doctor. Also, many newly insured individuals are probably accustomed to only going to the doctor when they are sick, so they may continue that trend and miss out on important primary and preventive care, even though they now have coverage. Finally, people may just not be aware of what kind of preventive services are available and/or which one they qualify for and when. A survey of a nationally representative sample found that only ~20% of adults had heard of "clinical preventive services," and only ~8% had heard of the USPSTF (Lantz et al., 2016). Additionally, only about 1/3 knew that the ACA requires most insurance plans to cover USPSTF recommended services at no cost-sharing (Lantz et al., 2016). Finally, there are discrepancies in adherence to the USPSTF guidelines among physicians (Grol, 2001), meaning that even if an individual goes to the doctor for a checkup, it is not guaranteed that they will receive the recommended preventive services.

Limitations

My study has several limitations. First, the NHIS uses a cross-sectional design, which makes it impossible to observe longitudinal trends at the individual level. Second, the NHIS is an interview survey, meaning that the data are self-reported, which can lead to recall bias. Next, the NHIS only asks whether the individual has received each preventive service during the past 12 months, which does not necessarily match up with the USPSTF recommendation guidelines. For example, pap smears are recommended every three years for all women aged 21-75. An individual who received a pap smear two years ago could have answered no to the NHIS question and been counted in my "eligible, but did not receive" group, even though they are up to date on this service according to USPSTF guidelines. Additionally, since data were only available up through 2015 at the time of this study, and the full implementation of the ACA took place in 2014, there may not be enough post-ACA data to detect true trends.

It is possible that, since I examined several outcomes and model specifications, my outcomes could be due to chance alone, also referred to as the multiple comparisons problem. Finally, I do not control for any type of moral hazard in my models. The concept of moral hazard refers to the tendency of individuals to overuse healthcare once insured, since they no longer have to pay costs out of pocket (Geyman, 2007). Ex-ante moral hazard, which refers to individuals being more likely to engage in risky health behavior once insured, since they will no longer be responsible for the full cost of care (Dave & Kaestner, 2009), could also affect my results. It is possible that individuals that are now insured under the ACA may not

feel the need to utilize the recommended preventive services, since they will not have to pay the full costs of any potentially preventable illnesses down the line.

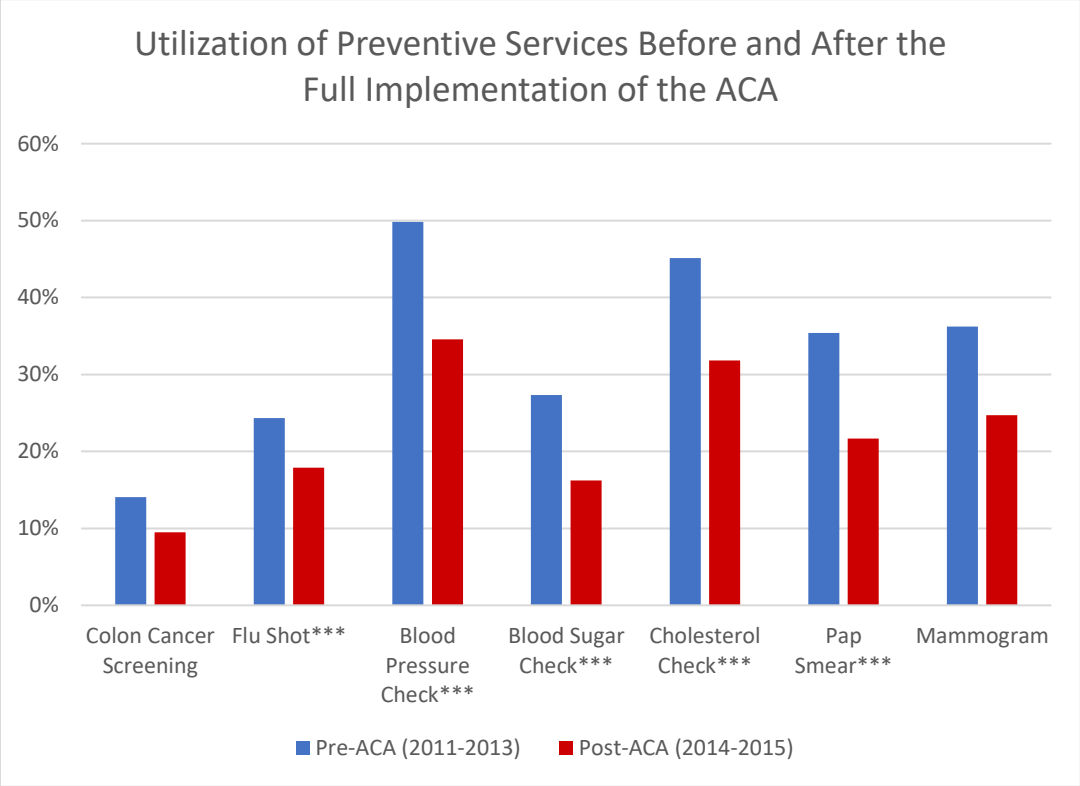
CONCLUSIONS AND POLICY IMPLICATIONS

The findings of this study support a common theme in health services research, which is that access does not equal utilization. Providing individuals with insurance coverage may not be enough to ensure that they are receiving the appropriate care. This could be due to several factors. As mentioned before, many people who gained coverage through the ACA were previous uninsured, which means that they may not have adequate knowledge of how to navigate the healthcare system. Additionally, even if people know how to get care once they have health insurance, many may not know what preventive services they are eligible and when. Finally, many young healthy people may forgo their necessary preventive services, because they don't feel like they need them and/or do not fully understand the burden that chronic diseases can have on individuals, communities, and society as a whole.

Consequently, focusing on education could help improve utilization rates, especially among those who were previously uninsured. Some examples of educational topics to focus on are: Why are preventive services important? What preventive services are required and for whom? What preventive services are covered through insurance plans? How do you get a preventive service, once you're covered? Such efforts to increase awareness of chronic diseases and preventive services could help increase utilization of preventive services and potentially reduce the burden of chronic diseases in the future.

FIGURES

Figure 2.1



Notes:

1) Data are from the National Health Interview Survey (NHIS) from 2011-2015
2) *p<0.05; **p<0.01; ***p<0.001

TABLES

Table 2.1: Model 1 – Logistic Regression Results (Odds Ratios) Examining Utilization Patterns of Preventive Services Among Vulnerable Populations

	Flu Shot	Blood Pressure Check	Blood Sugar Check	Choles-terol Check	Colon Cancer Check	Mamm-ogram	Pap Smear
Year Indicator							
Pre-ACA (2011-2013)	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Post-ACA (2014-2015)	1.13***	1.2***	0.74***	1.14***	0.87***	0.91*	0.78***
Race							
Non-Latino White	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Non-Latino Black	0.78***	1.11*	1.22***	1.37***	1.46***	1.16*	1.52***
Asian	1.28***	0.76***	1.32***	1.38***	0.99	1.1	0.71***
Latino	1.001	0.89**	1.43***	1.3***	1.16*	1.31**	1.12*
Income							
Poor Income <10k	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Low Income 10-20k	0.88**	0.83**	1.02	1.03	0.92	0.95	1.06
Medium Income 20-45k	0.995	1.02	1.19***	1.18*	1.02	1.09	1.32***
High Income >45k	1.24	1.42***	1.52***	1.59***	1.18*	1.34**	1.72***
Education							
No High School Education	Ref	Ref	Ref	Ref	Ref	Ref	Ref
High School Degree or GED	0.95	1.24***	1.05	1.22**	0.9	1.21	1.11
Some College	1.18**	1.59***	1.17**	1.36***	1.01	1.29**	1.22**
Associates	1.3***	1.62***	1.34***	1.39***	1.11	1.37**	1.31***
Bachelors	1.42***	1.75***	1.3***	1.52***	1.06	1.59***	1.49***
Masters	1.7***	2.07***	1.36***	1.73***	1.19*	1.57***	1.67***
Doctoral	2.68***	2.44***	1.53***	1.64***	1.12	1.51*	1.48***
Age (in years)	1.02***	1.01***	1.03***	1.04***	1.01*	1.01	0.98***
Sex							
Male	Ref	Ref	Ref	Ref	Ref		
Female	1.58***	2.58***	1.34***	1.3***	0.8***		
Employment							
Unemployed Past 12m	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Employed 2-6m Past 12m	0.86	0.97	0.96	1.05	0.82	0.92	1.27

	Flu Shot	Blood Pressure Check	Blood Sugar Check	Choles-terol Check	Colon Cancer Check	Mamm-ogram	Pap Smear
Employed 7-11m Past 12m	0.78**	0.87	0.95	0.95	0.84	0.85	1.31*
Employed 12m Past 12m	0.8**	0.79	0.98	0.98	0.81	0.81	1.22
Insurance Type							
Uninsured	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Private Insurance	1.9**	1.17	1.11	1.67*	1.38	2.27*	1.2
Medicare	2.78***	1.38	0.92	1.62*	1.49	2.02	1.02
Medicaid	1.61*	1.19	1.22	1.66*	1.41	1.71	1.58*
Other Insurance	1.3	0.64*	0.68*	0.77	0.95	1.12	0.72
Health Status							
Poor, Fair, or Good Health Status	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Very Good or Excellent Health Status	0.97	0.94	0.85	0.89**	1.05	1.26***	1.17***
Chronic Conditions							
No Chronic Conditions	Ref	Ref	Ref	Ref	Ref	Ref	Ref
1 Chronic Condition	1.29***	2.11***	1.56***	1.87***	1.39***	1.36***	1.1**
2-3 Chronic Conditions	1.82***	5.21***	2.57***	3.26***	1.63***	1.45***	0.99
4-5 Chronic Conditions	2.53***	17.33***	4.03***	6.63***	1.84***	1.52**	1.01
>5 Chronic Conditions	3.28***	12.29***	5.61***	11.26***	2.04***	1.37	0.59
Citizenship							
Not a US Citizen	Ref	Ref	Ref	Ref	Ref	Ref	Ref
US Citizen	1.09*	1.4***	0.99	1.07	1.09	1.03	1.41***
Region							
Northeast	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Midwest	0.98	0.98	1.12**	0.87**	0.92	0.85*	0.83***
South	0.96	0.96	1.1*	1.03	0.999	0.85*	0.94
West	0.86***	0.78***	0.96	0.74***	1.14*	0.81**	0.75***

Notes:

1) Data are from the National Health Interview Survey 2011-2015
2) *p<0.05, **p<0.01, ***p<0.001

Table 2.2: Model 2 – Logistic Regression Results (Odds Ratios) Assessing Whether the Full Implementation of the Affordable Care Act was Associated with Utilization Patterns of Preventive Services among Vulnerable Populations

Model 2a: Income	Flu Shot	Blood Pressure Check	Blood Sugar Check	Choles-terol Check	Colon Cancer Check	Mamm-ogram	Pap Smear
Year Indicator							
Pre-ACA (2011-2013)	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Post-ACA (2014-2015)	1.19**	1.38***	0.78***	1.13	0.94	1.24	0.82*
Income							
Poor Income <10k	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Low Income 10-20k	0.91	0.85*	1.06	1.01	0.96	1.12	1.15
Medium Income 20-45k	1.03	1.1	1.23***	1.17	1.02	1.26*	1.36***
High Income >45k	1.25***	1.51***	1.52***	1.59***	1.24*	1.53***	1.72***
Year*Income							
Pre-ACA*Poor	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Post-ACA *Low Income	0.94	0.92	0.9	1.04	0.89	0.67*	0.83
Post-ACA *Medium Income	0.91	0.82*	0.91	1.01	0.99	0.71*	0.94
Post-ACA *High Income	0.96	0.85	0.98	0.998	0.88	0.72*	1.004
Model 2b: Education	Flu Shot	Blood Pressure Check	Blood Sugar Check	Choles-terol Check	Colon Cancer Check	Mamm-ogram	Pap Smear
Year Indicator							
Pre-ACA (2011-2013)	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Post-ACA (2014-2015)	0.93	1.22*	0.7***	1.14	0.82	1.11	0.78*
Education							
No High School Education	Ref	Ref	Ref	Ref	Ref	Ref	Ref
High School Degree or GED	0.88*	1.26**	1.07	1.2*	0.85	1.33*	1.15
Some College	1.11	1.57***	1.18**	1.38***	0.96	1.36*	1.23**
Associates	1.22***	1.64***	1.31***	1.38***	1.12	1.57***	1.33**
Bachelors	1.28***	1.8***	1.24***	1.53***	1.09	1.73***	1.48***
Masters	1.52***	2.15***	1.29***	1.71***	1.09	1.7***	1.68***
Doctoral	2.47***	2.3***	1.46***	1.69***	1.11	1.68*	1.35*
Year*Education							
Pre-ACA	Ref	Ref	Ref	Ref	Ref	Ref	Ref

*Less than High School or GED							
Post-ACA *High School or GED	1.21*	0.97	0.96	1.03	1.15	0.8	0.93
Post-ACA *Some College	1.16	1.05	0.99	0.96	1.15	0.88	0.98
Post-ACA *Associates	1.15	0.97	1.06	1.01	0.98	0.73	0.97
Post-ACA *Bachelors	1.28**	0.93	1.13	0.99	0.93	0.81	1.02
Post-ACA *Masters	1.31**	0.92	1.14	1.02	1.24	0.83	0.99
Post-ACA *Doctoral	1.22	1.17	1.12	0.93	1.01	0.78	1.25
Model 2c: Race	Flu Shot	Blood Pressure Check	Blood Sugar Check	Choles-terol Check	Colon Cancer Check	Mamm-ogram	Pap Smear
Year Indicator							
Pre-ACA (2011-2013)	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Post-ACA (2014-2015)	1.14***	1.16***	0.75***	1.1**	0.88**	0.87**	0.76***
Race							
Non-Latino White	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Non-Latino Black	0.79***	1.05	1.27***	1.27***	1.53***	1.01	1.44***
Asian	1.24***	0.76***	1.29***	1.31***	1.06	0.85	0.71***
Latino	1.03	0.85**	1.43***	1.25***	1.14	1.35**	1.09
Year*Race							
Pre-ACA *Non-Latino White	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Post-ACA *Non-Latino Black	0.95	1.15	0.92	1.22*	0.9	1.42*	1.13
Post-ACA*Asian	1.09	1.01	1.05	1.14	0.86	1.71*	0.996
Post-ACA*Latino	0.94	1.11	0.99	1.09	1.04	0.95	1.06

Notes:

1) Data are from the National Health Interview Survey 2011-2015
2) *p<0.05, **p<0.01, ***p<0.001

Table 2.3: Model 3 – Logistic Regression Results (Odds Ratios) Examining Association of Having Insurance Purchased through the Affordable Care Act Exchanges with the Odds of Utilization of Preventive Services among the Privately Insured 2014 and 2015

	Flu Shot	Blood Pressure Check	Blood Sugar Check	Choles-terol Check	Colon Cancer Check	Mamm-ogram	Pap Smear
Exchange Status							
Non-Exchange Plan	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Exchange Plan	0.58***	0.56***	0.94	0.7**	0.65*	0.52***	0.78**
Race							
Non-Latino White	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Non-Latino Black	0.74***	1.18	1.21***	1.6***	1.32**	1.41**	1.51***
Asian	1.38***	0.74***	1.26**	1.35**	0.85	1.51	0.73**
Latino	0.97	0.99	1.39***	1.27**	1.09	1.21	1.18*
Age (in years)	1.02***	1.02***	1.03***	1.04***	1.01*	1.01	0.98***
Sex							
Male	Ref	Ref	Ref	Ref	Ref		
Female	1.6***	2.71***	1.36***	1.29***	0.78***		
Education							
No High School Education	Ref	Ref	Ref	Ref	Ref	Ref	Ref
High School Degree or GED	1.003	1.22	1.04	1.33*	1.06	1.29	1.2
Some College	1.22*	1.73***	1.15	1.35*	1.19	1.39	1.33*
Associates	1.39***	1.72***	1.39***	1.51**	1.21	1.3	1.39*
Bachelors	1.57***	1.81***	1.42***	1.65***	1.15	1.66*	1.68***
Masters	1.92***	2.02***	1.52***	1.95***	1.44*	1.68*	1.81***
Doctoral	3.03***	2.76***	1.68***	1.78***	1.32	1.81*	1.93***
Employment							
Unemployed Past 12m	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Employed 2-6m Past 12m	0.92	1.25	0.9	1.3	1.04	0.98	1.32
Employed 7-11m Past 12m	0.89	0.98	0.82	1.05	0.98	0.64	1.24
Employed 12m Past 12m	0.85	0.94	0.85	1.25	0.87	0.59	1.19
Income							
Poor Income <10k	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Low Income 10-20k	0.83*	0.78*	0.93	0.98	0.86	0.88	0.99
Medium Income 20-45k	0.89	0.86	1.14	1.04	0.99	0.99	1.3*

	Flu Shot	Blood Pressure Check	Blood Sugar Check	Choles-terol Check	Colon Cancer Check	Mamm-ogram	Pap Smear
High Income >45k	1.06	1.15	1.48***	1.33*	1.01	1.17	1.67***
Health Status							
Poor, Fair, or Good Health Status	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Very Good or Excellent Health Status	0.98	0.99	0.8***	0.89	1.005	1.2*	1.15**
Chronic Conditions							
No Chronic Conditions	Ref	Ref	Ref	Ref	Ref	Ref	Ref
1 Chronic Condition	1.27***	2.1***	1.5***	1.82***	1.6***	1.39**	1.18**
2-3 Chronic Conditions	1.57***	4.76***	2.38***	2.69***	1.73***	1.45***	1.02
4-5 Chronic Conditions	2.25***	10.62***	3.59***	5.78***	2.11***	1.39	0.93
>5 Chronic Conditions	2.9***	77.05***	5.15***	5.55**	2.35*	2.55	0.33
Citizenship							
Not a US Citizen	Ref	Ref	Ref	Ref	Ref	Ref	Ref
US Citizen	1.24**	1.32**	0.98	0.995	0.87	1.001	1.52***
Region							
Northeast	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Midwest	0.97	1.02	1.22**	0.99	0.87	0.85	0.85
South	1.002	1.02	1.13	1.21*	0.95	0.92	0.97
West	0.87**	0.8*	1.04	0.91	1.31**	0.84	0.74***

Notes:

1) Data are from the National Health Interview Survey 2011-2015
2) *p<0.05, **p<0.01, ***p<0.001

Chapter 3: Variation of Preventive Service Utilization by State Medicaid Coverage and Cost Sharing Policies and Medicaid Expansion Status

INTRODUCTION

Medicaid is a public, government-financed health insurance program that provides coverage at little to no cost to low-income Americans. Medicaid spending accounted for 17% of national healthcare expenditures in 2015, which equates to nearly 3% gross domestic product (CMS, 2016a). Funded jointly by state and federal governments, Medicaid covered about 68 million individuals in December 2016, which is about 1/5th of the US population (CMS, 2017).

Chronic Conditions and Preventive Care

Chronic disease related illnesses made up 86% of all healthcare expenditures in 2010 (Gerteis et al., 2014), and healthcare expenditures accounted for 17.4% of Gross Domestic Product spending in the United States in 2013 (Hartman, Martin, Lassman, & Catlin, 2015). Access to primary care and preventive services can potentially help curb the cost associated with chronic disease (CDC, 2013). Early screening and detection can prevent chronic diseases from worsening and sometimes from occurring all together, which could help curb the costs associated with chronic conditions in some cases (CDC, 2013). It is estimated that if more people utilized preventive services, two million life years could be saved annually (Maciosek, Coffield, Flottemesch, Edwards, & Solberg, 2010). However, many people who need preventive care do not have timely access to preventive care or simply cannot afford it (Cheung et al., 2012; Meissner, Klabunde, Breen, & Zapka, 2012).

Many Medicaid beneficiaries have chronic health conditions, especially obesity, that could be avoided or managed by adequate preventive services (Government Accountability Office [GAO], 2009). Chronic condition rates among Medicaid beneficiaries are higher than both the rates of the privately insured (Smolen, Thorpe, Bowie, Gaskin, & LaVeist, 2014) and the uninsured (KCMU, 2012a). Hence, coverage of preventive services is a critical issue for the Medicaid beneficiary population.

Medicaid Coverage of Preventive Care

Coverage of preventive services varies widely among state Medicaid programs. A study found that of the 42 USPSTF A and B recommended preventive services, each was covered for non-elderly adults by at least 1/2 of the states in 2010, if not 2/3 (KCMU, 2012b). Fourteen states covered all services, 25 states covered 40 or more services, and 44 covered 30 or more (KCMU, 2012b). Yet, there was even more variation in cost sharing across the states. Cost-sharing has been demonstrated as a barrier to access to care (Solanki & Schauffler, 1999), especially for low-income individuals, which make up a large portion of Medicaid beneficiaries. Of the 14 states who covered all the recommended services, only 6 covered all services without cost sharing (KCMU, 2012b). Twenty-five states reported no cost sharing for at least one of the recommended services (KCMU, 2012b).

In an effort by the Affordable Care Act (ACA) to reduce variation in preventive service coverage and cost sharing among Medicaid programs, an incentive of a one percentage point increase in federal match rate for preventive care was offered, beginning January 2013, to any state who covered all the recommended

vaccines and USPSTF A and B level preventive services at no cost sharing (Gates, Ranji, & Snyder, 2014). In a follow-up of the previous Kaiser study examining variation in preventive service coverage in Medicaid programs in 2010, as of January 2013, eight out of 40 states surveyed covered all recommended preventive services, and four states covered all services with some cost sharing (Gates, Ranji, & Snyder, 2014). Of the remaining states, 16 covered at least 40 of the 47 surveyed preventive services with some cost sharing, and 12 covered <40 with some cost sharing (Gates, Ranji, & Snyder, 2014).

Medicaid Expansion and Preventive Care

The ACA aims to increase access to care and preventive services through the Medicaid expansion. Under the Medicaid expansion, states are given the option to expand their Medicaid programs to everyone up to 138% FPL, including childless adults, beginning January 1, 2014. Additionally, the ACA stipulates that Medicaid expansion plans must cover the USPSTF A and B level recommended preventive services at no cost sharing. As of January 1, 2017, 32 states (including DC) opted to expand their Medicaid programs, and 19 states opted out of the Medicaid expansion at this time (KFF, 2017a). As of March 2016, 14 million people gained insurance coverage through the Medicaid expansion, and 11 million of those were newly insured (CMS, 2016b).

Previous Medicaid expansions have been associated with an increase in preventive service utilization. The Oregon Medicaid expansion lottery in 2012 resulted in higher rates of cancer screenings and primary care (Wright et al., 2016). The authors of this study used panel data and intent to treat two stage least squares

analyses to examine the effect of expanded Medicaid coverage on the utilization of breast, cervical, colorectal, and prostate cancer screening as well as HPV vaccine (Wright et al., 2016). Results showed that receiving Medicaid coverage through the lottery was associated with a significant increase in utilization of pap smears and colonoscopies, but no other effects were seen (Wright et al., 2016). Limitations of this study include that it only includes data from Oregon, and there are only two timepoints measured, once before (2011) and once after expansion (2012) (Wright et al., 2016).

Using BRFSS data from 2010 to 2015, a study examined the effect of Medicaid expansion through the ACA on the utilization of seven preventive services: routine check-up, flu shot, dental visit, pap smear, clinical breast exam, mammogram, and HIV screening in the past year (Simon, Soni, & Cawley, 2017). The authors used difference-in-differences analyses and found that Medicaid expansion resulted in a significant increase in utilization of HIV tests, but no effects were seen on the other preventive services (Simon, Soni, & Cawley, 2017). A major limitation of this study is that BRFSS does not report type of insurance, only whether the person was insured, except in 2014. This means that any effects cannot be guaranteed to be the result of Medicaid expansion itself, but could also be due to increased coverage through the state exchanges. The authors try to exclude those who would be eligible for exchange subsidies by only using adults with incomes under 100% FPL, but in doing so risk missing important effects among adults with incomes between 100% and 138% FPL who were newly eligible in many states under Medicaid expansion. Another limitation is that they stratify their sample by sex and parental status, but not race and

ethnicity, which are important vulnerable populations. Finally, many outcome variables are not available in odd years of BRFSS, so their sample drops those years, which could bias results.

The Affordable Care Act and Vulnerable Populations

Ongoing healthcare reform includes policies that focus specifically on increasing access to care for vulnerable populations. Vulnerable populations include racial and/or ethnic minorities, economically disadvantaged individuals, individuals who are seriously ill, and institutionalized individuals (National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, 1979). Economically disadvantaged populations have been shown to have poorer access to preventive services than high-income populations. For example, a study of the utilization of six preventive services (HIV test, smoking cessation discussion, flu shot, pneumococcal vaccination, tetanus vaccination, and zoster vaccination) using NHIS data from 2011-2012 found that those with income >200% FPL were more likely to receive all services but HIV test (Fox & Shaw, 2014). A similar study examining blood pressure screening, cholesterol screening, colon cancer screening, diet counseling, blood sugar check, hepatitis A vaccination, hepatitis B vaccination, mammogram, and pap smear found that those with incomes >200% FPL were significantly more likely to receive all services, except for hepatitis A vaccination (Fox & Shaw, 2015).

Racial and ethnic minorities are another vulnerable population targeted by the ACA's effort to reduce health disparities. Racial and ethnic minorities face substantial disparities in access to care and health outcomes. Non-Latino Blacks (DHHS, 2016),

Asians (DHHS, 2014), and Latinos (DHHS, 2015) have lower rates of health insurance and experience higher rates of morbidity and mortality than non-Latino Whites. Research has shown evidence that ACA can reduce health disparities (Chen et al., 2016). On the other hand, research has also shown that minorities often have higher rates of preventive service utilization than non-Latino Whites (Holden, Chen, & Dagher, 2015). No studies to my knowledge examine the effect of the ACA on disparities in preventive services utilization among vulnerable populations.

Study Objectives

Given the importance of Medicaid coverage of and copay for preventive services on utilization of preventive services, I hypothesize that among Medicaid beneficiaries: 1) Medicaid coverage of preventive services will be associated with an increase in utilization of preventive services, 2) Medicaid copay for preventive services will associated with a decrease in utilization of preventive services, 3) Medicaid expansion will increase utilization of preventive services, and 4) Medicaid expansion will decrease disparities in utilization rates of preventive services among vulnerable populations.

I believe that utilization of preventive services among Medicaid beneficiaries will be positively associated with Medicaid coverage of preventive services and negatively associated with copay for preventive services, since Medicaid beneficiaries are typically low-income and are less likely to be able to afford to pay for preventive services out of pocket. Next, since the Medicaid expansion provided additional insurance coverage to nearly 10 million people, many of whom were previously uninsured, it is possible that these individuals have been putting off getting their

preventive services due to costs. Now with the Medicaid expansion covering USPSTF A and B recommended preventive services at no cost sharing, it is likely that utilization of said services will increase in expansion states. Finally, since the ACA includes many provisions aimed at increasing access to care for vulnerable populations, including the Medicaid expansion itself, I expect to see a reduction in disparities in utilization of preventive services among vulnerable populations.

METHODS

Data

Medical Expenditures Panel Survey (MEPS). My study used four data sets to test the study objectives. First is individual-level data from the Medical Expenditure Panel Survey (MEPS). Beginning in 1996, MEPS is a set of large scale surveys that assesses healthcare services utilized by Americans (Agency for Healthcare Research & Quality (AHRQ), 2009). MEPS includes detailed demographic information, as well as information on health conditions, health status, use of medical services, charges and source of payments, access to care, satisfaction with care, health insurance coverage, income, and employment (AHRQ, 2009). From MEPS, I used data on preventive service utilization as well as demographic, socioeconomic, geographic, and health status and access variables. The MEPS data were linked with Kaiser data on Medicaid preventive service policies and expansion status at the state level, described in more detail below.

Medicaid preventive services policy data. The next data sets were two surveys of state Medicaid program coverage of preventive services, conducted by the Kaiser Family Foundation, once in 2010, and once in 2013. In 2010, 48 states (not

including Wisconsin, Hawaii, and the District of Columbia) were asked about coverage of 42 preventive services recommended by the USPSTF and the Advisory Committee on Immunization Practices (ACIP) (KCMU, 2012b). Each state Medicaid Department was asked if they covered the service and if so, was there a copay (KCMU, 2012b). In 2013, Kaiser repeated the survey with 39 states plus the District of Columbia (not including Florida, Georgia, Indiana, Kansas, Louisiana, Nebraska, New Mexico, Ohio, South Carolina, Vermont, and Wisconsin) asking about their coverage of and copay for 47 preventive services recommended by the USPSTF, ACIP, and the Health Resources and Services Administration (HRSA) (Gates, Ranji, & Snyder, 2014).

Medicaid expansion data. Kaiser also provides information on Medicaid expansion status, which I used in my analyses. For my study purposes, I used the Medicaid expansion status of each state on January 1, 2014. On January 1, 2014, 25 states, including the District of Columbia, opted to expand their Medicaid programs, and 26 states chose not to expand at that time (See Appendix 3.1).

Dependent Variables

The main outcome of interest was whether the individual was up to date on each of three preventive services. I constructed these variables using the MEPS variable of how long it has been since the preventive service was received and matched it for each preventive service based on UTPSTF, ACIP, and HRSA recommendations, which are outlined in more detail below. MEPS includes such variables for three preventive services of interest: 1) blood pressure check, 2) cholesterol check, and 3) flu shot. For each of the three preventive services, an

indicator variable was created (eligible but did not receive service* versus eligible and did receive service).

Key Independent Variables

For my first two objectives, whether state Medicaid coverage of and copay for preventive services were associated with utilization rates of said preventive services, I constructed a state-level categorical policy variable that reflected coverage of and copay for each preventive service (no coverage* versus coverage with copay and coverage without copay). Data used in these models were from 2010 and 2013 only.

For my third objective, whether Medicaid expansion affected utilization of preventive services among Medicaid beneficiaries, I constructed a state-level indicator variable for Medicaid expansion status (not expanding as of January 1, 2014* versus expanding as of January 1, 2014), as well as a pre-/post-expansion indicator variable (pre-Medicaid expansion [2009-2013]* versus post-Medicaid expansion [2014]). I used difference-in-differences analyses to examine the effect of Medicaid expansion on preventive service utilization by generating an interaction term between the expansion status and post-expansion indicator variables. Specific methods are discussed in more detail below.

Lastly, for my fourth objective, whether Medicaid expansion affected disparities in preventive service utilization among vulnerable populations, including income and racial/ethnic groups, I used difference-in-difference-in-differences analyses where I constructed interaction terms between 1) post-expansion indicator, expansion status indicator, and race/ethnicity, and 2) post-expansion indicator, expansion status indicator, and income. Detailed methods are presented below.

Other Independent Variables

In addition to my main independent variables of interest, I controlled for demographic, socioeconomic, health status, and geographic variables. Demographic variables included age (in years), sex (male* versus female), race and ethnicity (non-Latino White* versus Black, Asian/Hawaiian/Pacific Islander, Latino, and other race), and marital status (not married* versus married). Socioeconomic status variables included education (less than high school* versus high school diploma and above), employment (unemployed all year* versus employed at any time during the year), and income as percent of FPL (poor [<100%FPL]* versus near poor [100%-124%], low-income [125-199%], and medium- and high-income [200+%]). Health status variables included number of chronic conditions (no chronic conditions* versus one chronic condition and multiple chronic conditions) and self-reported health status (poor, fair, or good health* versus very good or excellent health). Geographic variables included US census region (Northeast* versus Midwest, South, and West), metropolitan statistical area (non-MSA* versus MSA), and state. I also controlled for interview language (not English* versus English) and year of survey (2010* versus 2013 in Model 1).

Sample

My total sample included all individuals in MEPS 2009-2014 who reported continuous Medicaid coverage over the past year and were eligible for at least one of the five preventive services analyzed. The USPSTF recommends that blood pressure screening be performed on all adults (n=15,401) and cholesterol screening be performed on males beginning at age 35 and females beginning at age 45 (n=7,417).

The CDC recommends that everyone has a flu shot (n=15,320) (Grohskopf et al., 2016).

Analysis

I first examined the proportions of those eligible for each preventive service over each independent variable. Next, I examined the proportion of those who were eligible for and received each preventive service for each year in my sample, to check for unadjusted linear trends in utilization rates. I then used multivariable logistic regression models to evaluate the association of state Medicaid policy on coverage of and copay for each preventive service with utilization of said preventive service, controlling for demographic, socioeconomic, geographic and healthcare status variables, as well as state fixed effects. Since my state Medicaid policy data were only for two years (2010 and 2013), I only used 2010 and 2013 MEPS data in Model 1.

Next, I examined proportions of those in my entire sample (MEPS 2009-2014) who were eligible for and received each of the three preventive services over both pre- and post-Medicaid expansion years and non-Medicaid expansion and expansion states. I then used linear probability difference-in-differences models to evaluate the effect of Medicaid expansion with utilization of my three preventive services, controlling for demographic, socioeconomic, geographic, and healthcare status variables, as well as state fixed effects. The benefit of difference-in-differences models is that they eliminate fixed factors that may affect both the treatment and control groups and therefore may bias results. The first difference was expansion status (non-expansion* versus expansion states), and the second difference was pre-

versus post-expansion (2011-2013* versus 2014). Difference-in-differences models rely on the parallel trends assumption, which means that the change in outcome in the control group is what would be expected in the treatment group, had the treatment not occurred. Previous studies examining the effect of Medicaid expansion on utilization of preventive services have used and tested this parallel trends assumption in their difference-in-differences models (Simon, Soni, & Cawley, 2017).

Lastly, I used linear probability difference-in-difference-in-differences models to evaluate the effect of Medicaid expansion on disparities in preventive service utilization among vulnerable populations. I added a third difference to two separate models, one of which was race (non-Latino White* versus Black, Latino, and Asian/Hawaiian/Pacific Islander), and the other income (poor* versus near poor, low-income, and med- and high-income). These models allowed me to control for fixed effects that could affect different racial and ethnic or income groups in expansion and non-expansion states.

I used Stata 14 to perform all analyses, and I used the *svy* commands to obtain population estimates. MEPS randomly selects a small sample of the US population for their surveys, which means that performing analyses on only this sample could result in estimation bias, especially when attempting to generalize results to the entire US population. To account for this bias, MEPS includes probability weights, strata, and sampling units for each record to allow for more robust population estimates based on the sample. The Stata *svy* commands are a set of commands that allow researchers to obtain estimates using complex survey design data, such as MEPS. I used the *svyset, svy: tab, svy: proportion (lincom), svy: logit, and svy: reg* commands

to conduct my analyses based on the complex survey design of MEPS. All models control for state fixed effects.

RESULTS

Population Characteristics

Overall, of those eligible for each preventive service, 87.69% received a blood pressure check, 84.83% received a cholesterol check, and 42.33% received a flu shot. My sample was 43.18% White, 23.58% Black, 6.02% Asian/Hawaiian/Pacific Islander, 23.01% Latino, and 4.21% other race. Sixty-four percent were female, 25.32% were married, 62.35% had at least a high school degree, 97.07% were employed for at least one month out of the last 12 months, and 18.72% had medium or high incomes. Thirty-six percent reported excellent or good health, and 34.1% had no chronic conditions.

Model 1: Association of State Medicaid Policy with Utilization of Preventive Services (MEPS 2010 & 2013)

Population characteristics. Most of my population that was eligible for preventive services lived in states whose Medicaid programs covered said preventive services. Approximately 70% (62%-76%) of my population lived in states whose Medicaid programs covered preventive services with no copay (See Figure 3.1). Approximately 28% (19%-38%) of my population lived in states whose Medicaid programs covered preventive services with a copay, and approximately 2% (1%-5%) of my population lived in states whose Medicaid programs did not cover preventive services.

Multivariable logistic regression results. Results of multivariable logistic regressions (See Table 3.1) showed that the only significant association between Medicaid policy and utilization of preventive services was that those in states with Medicaid programs that covered flu shot (both with and without copay) were significantly more likely to receive their flu shot than those in states with Medicaid programs that do not cover flu shots (ORs = 6.88 and 6.22, ps<0.001, respectively). I found no significant association of Medicaid state policy with utilization of blood pressure check or cholesterol check for those interviewed in 2010 and 2013 who report continuous Medicaid coverage for the past year.

In terms of control variables, age was significantly positively associated with blood pressure check, cholesterol check, and flu shot (See Table 3.1). Females were significantly more likely to receive blood pressure check and flu shot. In terms of race and ethnicity, compared to non-Latino Whites, Asian/Hawaiians/Pacific Islanders were more likely to receive a flu shot, and Latinos were less likely to receive a blood pressure check and more likely to receive a flu shot. For income, compared to poor individuals, low-income individuals were more likely to receive cholesterol check. Those with any chronic conditions were more likely to receive blood pressure check and flu shot, and those with multiple chronic conditions were more likely to receive cholesterol check. Finally, those with very good or excellent self-reported health status were significantly less likely to receive blood pressure check. I saw no association between preventive service utilization among Medicaid beneficiaries and year of interview, employment, education, MSA, and interview language.

Model 2: Effect of Medicaid Expansion on Utilization of Preventive Services (MEPS 2009-2014)

Population characteristics. Utilization rates of each preventive service were mostly the same from 2009-2013 (See Figure 3.2). When I compared utilization rates pre- and post-Medicaid expansion (2014) I saw significant increases in blood pressure screening, cholesterol screening, and flu shot (See Figure 3.3).

When I compared utilization rate of preventive services among eligible Medicaid beneficiaries between Medicaid expansion and non-Medicaid expansion states, those who lived in expansion states had significantly lower levels of blood pressure screening and cholesterol screening, compared to those who lived in non-expansion states (See Figure 3.4). I saw no significant differences in utilization of flu shot between expansion and non-expansion states.

Difference-in-differences regressions results. I saw no significant effects of Medicaid expansion on utilization of flu shot, blood pressure check, or cholesterol check (See Table 3.2). However, Medicaid expansion increased the odds of having a flu shot overall (Coef=0.07, $p<0.05$).

Results also showed that age was significantly positively associated with blood pressure check, cholesterol check, and flu shot. Females were significantly more likely to receive blood pressure check, cholesterol check, and flu shot. In terms of race and ethnicity, compared to non-Latino Whites, non-Latino Blacks were more likely to receive a cholesterol check, Asian/Hawaiians/Pacific Islanders were more likely to receive cholesterol check and flu shot, and Latinos were more likely to receive cholesterol check and flu shot. For income, compared to poor individuals, low-, and medium- and high-income individuals were more likely to receive flu shot,

and medium- and high-income individuals were more likely to receive cholesterol check. Those with any chronic conditions were more likely to receive all services. Those with very good or excellent self-reported health status were significantly less likely to receive blood pressure check. Compared to individuals in the Northeast, those in the Midwest, South, and West were significantly less likely to receive cholesterol check. Those in the Midwest and South were less likely to receive blood pressure check. Those in the Midwest were more likely to receive flu shot, and those in the west less likely to receive flu shot. MSA was significantly positively associated with blood pressure check and cholesterol check.

Model 3: Effect of Medicaid Expansion on Utilization of Preventive Services among Vulnerable Populations (MEPS 2009-2014)

I used linear probability difference-in-difference-in-differences analyses to evaluate the effect of Medicaid expansion on disparities in utilization rates of preventive services among a) income groups and b) racial and ethnic groups. In Model 3a, I found that Medicaid expansion increased utilization of flu shot among near poor individuals (See Table 3.3). In terms of individual independent variables of interest, I saw that utilization rates significantly increased post-expansion for flu shots. For my two-way interactions, near poor individuals post-expansion were significantly more likely to receive cholesterol check and significantly less likely to receive flu shot.

Control variables in Model 3a were similar to those in Model 2. In terms of race and ethnicity, compared to non-Latino Whites, Asian/Hawaiians/Pacific Islanders were less likely to receive blood pressure check. Employment and high

school education were again not significantly associated with receiving any preventive service.

For Model 3b, examining the effect of Medicaid expansion on disparities in preventive service utilization among racial and ethnic groups, I found that Medicaid expansion increased utilization of flu shots for Latinos and Asians/Hawaiians/Pacific Islanders.

For individual-level independent variables of interest, pre- versus post-expansion and expansion vs. non-expansion results were similar. Asians/Hawaiians/Pacific Islanders were significantly more likely to receive flu shots than non-Latino Whites. In terms of two-way interactions of my variables of interest, those who lived in expansion states post-expansion were significantly less likely to receive flu shot, and Asians/Hawaiians/Pacific Islanders in expansion state post-expansion were significantly less likely to receive flu shot. Other control variables in Model 3b were similar to Model 3a. Those with any chronic conditions were more likely to receive all services.

DISCUSSION

I hypothesized that those in states whose Medicaid programs covered preventive services, both with and without copay, would have higher utilization rates than those in states whose Medicaid programs did not cover preventive services, and I did observe this trend in flu shots. Although widely available at many pharmacies, the average cost of flu shot is approximately $30. For Medicaid beneficiaries, who typically have low incomes, $30 can be a significant amount of money and could definitely be a barrier to accessing care. The maximum allowable charge for

Medicaid beneficiaries to access non-institutional care varied from $4.00 to 20% of the total cost of the visit in 2013 (CMS, 2014), so a Medicaid beneficiary would not owe a $30 copay unless the total cost of their visit was $150.

Results showed that state Medicaid policy on coverage of and copay for preventive services was not associated with the use of blood pressure check or cholesterol check. The lack of association between Medicaid policy and utilization of these preventive services could be due to several reasons. First, as previously mentioned, Medicaid copays tend to be very small, so they may not be large enough to result in any significant difference in utilization rates. In addition, some preventive services are often available for free in the community. For example, many grocery stores or pharmacies have blood pressure cuffs that one can use for free to check their blood pressure. Additionally, many safety net providers, such as church and/or community health centers, and community health fairs often offer wellness checks at little or no cost to low income individuals. Hence, I speculate that the availability of the community services and relatively low copay diminishes the effect of Medicaid policy on utilization of blood pressure and cholesterol check.

I hypothesized that Medicaid expansion would result in an increase in utilization of preventive services. Although unadjusted statistics show that flu shot, blood pressure check, and cholesterol check utilization was higher post-expansion, after controlling for individual characteristics, difference-in-differences results showed no effect Medicaid expansion on utilization of these services. These results suggest that there could be a significant interaction between expansion status, expansion year, and at least one other control variable for the preventive services in

my models. Race and ethnicity, number of chronic conditions, sex, and region were significantly associated with utilization of preventive services in all models. Additionally, income was significantly associated with utilization in all models, except blood pressure check.

Difference-in-difference-in-differences results suggested that, at least in terms of access to flu shots, state Medicaid expansions are reaching the target audience – the near poor, whose incomes are between 100%-125% FPL. These are the individuals who are in the coverage gap. The coverage gap refers to those with incomes above the threshold necessary to qualify for Medicaid, but below the threshold to afford private insurance and/or qualify for the premium subsidies in the state exchanges (Garfield & Damico, 2016). Results also showed that Medicaid expansion was increased utilization of flu shots among Latinos and Asian/Hawaiian/Pacific Islanders. These findings are consistent with my results from Models 1 and 2.

My results for Model 3 suggested that Medicaid expansion did not have much effect on disparities in preventive services utilization among vulnerable populations. This could be because vulnerable populations have less knowledge of the expanded coverage options available through the ACA (Sommers et al., 2015; Garcia Mosqueira, Hua, & Sommers, 2015) and how to navigate the health system in general. Many people who obtained coverage under the Medicaid expansion were previously uninsured (CMS, 2016b). This could indicate that these individuals do not know how to properly navigate the healthcare system, even though they now have more affordable access to healthcare. Also, even for those who do know how to

navigate the healthcare system, many individuals are not aware what preventive services they are eligible for and when they are eligible for said services (Lantz et al., 2016). Finally, there are discrepancies in adherence to the USPSTF guidelines among physicians (Grol, 2001), meaning that even if an individual goes to the doctor for a checkup, it is not guaranteed that they will receive the recommended preventive services.

Limitations

My study has several limitations. In terms of my datasets, MEPS uses a cross-sectional design, which makes it impossible to observe longitudinal trends at the individual level. Since MEPS is an interview survey, the data are self-reported, which can lead to recall bias. Additionally, MEPS data were only available through 2014 at the time of this study, and since Medicaid expansion took place in 2014, there may not be enough post-ACA data to detect true effects. Lastly, the Kaiser survey of state Medicaid policies of preventive service coverage and copay only asked the state Medicaid programs whether they required a copay for each service, not how much each copay was.

For my sample, I only included those who were enrolled in Medicaid continuously for the previous year, which greatly reduces my sample size. I chose this sample, however, to avoid any contamination of effects that may be due to churning, or switching back and forth between different types of insurance and/or being uninsured. Finally, I assume in my models that if someone lives in an expansion state that they will have their preventive services covered with no copay. However, those on Medicaid plans before January 1, 2014 may or may not have been grandfathered

into this provision of the ACA, meaning there could be variation within each state on whether each preventive service was covered by Medicaid, with or without copay.

Finally, I do not control for any type of moral hazard in my models. The concept of moral hazard refers to the tendency of individuals to overuse healthcare once insured, since they no longer have to pay costs out of pocket (Geyman, 2007). Ex-ante moral hazard, which refers to individuals being more likely to engage in risky health behavior once insured, since they will no longer be responsible for the full cost of care (Dave & Kaestner, 2009), could also affect my results. It is possible that individuals that are now insured under the ACA may not feel the need to utilize the recommended preventive services, since they will not have to pay the full costs of any potentially preventable illnesses down the line.

CONCLUSIONS AND POLICY IMPLICATIONS

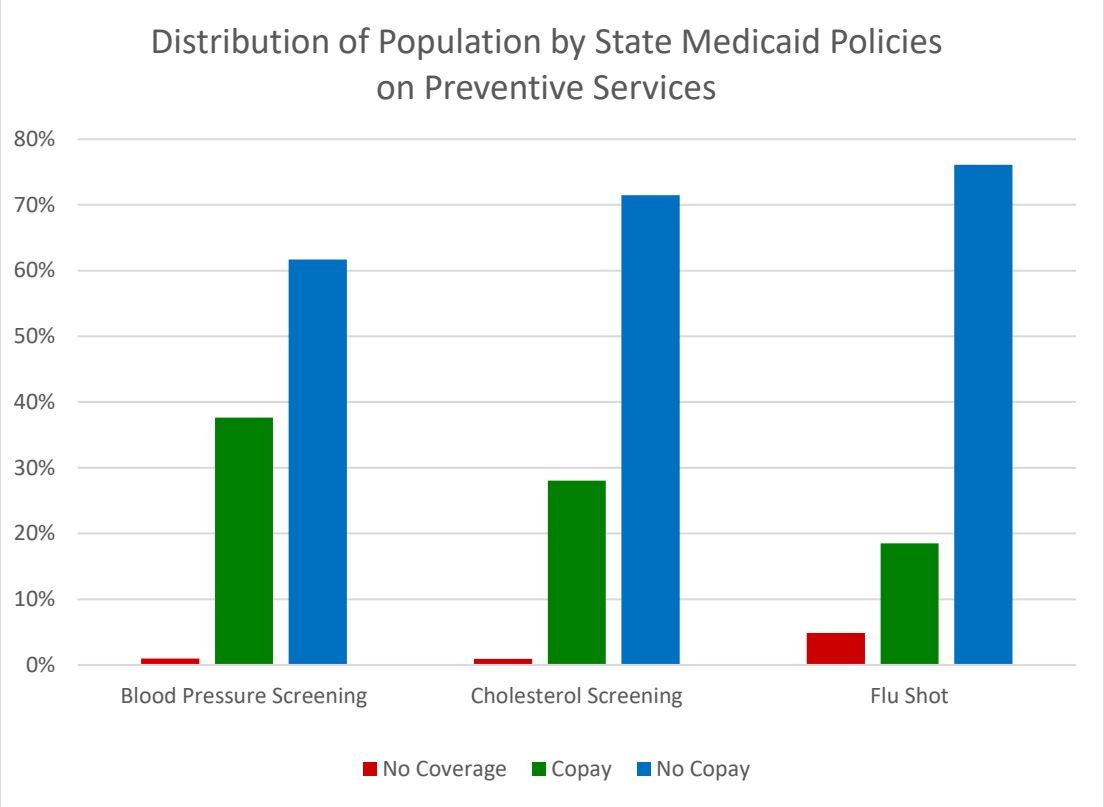
This study supports a common theme in health services research, which is that increased access to healthcare does not necessarily result in increased utilization of healthcare. Providing individuals with insurance coverage may not be enough to ensure that they are receiving the appropriate care. This is especially important when dealing with vulnerable populations, who typically have poorer health outcomes and could benefit from increased utilization of preventive services. The discrepancies in utilization rates revealed in my results could be due to several factors mentioned above, including lack of knowledge of how to navigate the healthcare system among the newly insured and lack of knowledge of preventive service recommendations among patients and providers. An additional gap of knowledge could be that many young, healthy people may not obtain their necessary preventive services, because

they feel as if they do not need to utilize healthcare if they are young and healthy, and/or perhaps they do not fully understand the burden that chronic diseases can have on individuals, communities, and society as a whole.

Results of this study suggest that focusing on improving health literacy could help improve utilization rates of preventive services, especially among vulnerable populations and those who were previously uninsured. Some examples of educational topics to focus on are: Why are preventive services important? What preventive services are required and for whom? What preventive services are covered through insurance plans? How do you get a preventive service, once you're covered? Such efforts to increase awareness on chronic diseases and preventive services could help increase utilization of preventive services and potentially reduce the burden of chronic diseases.

FIGURES

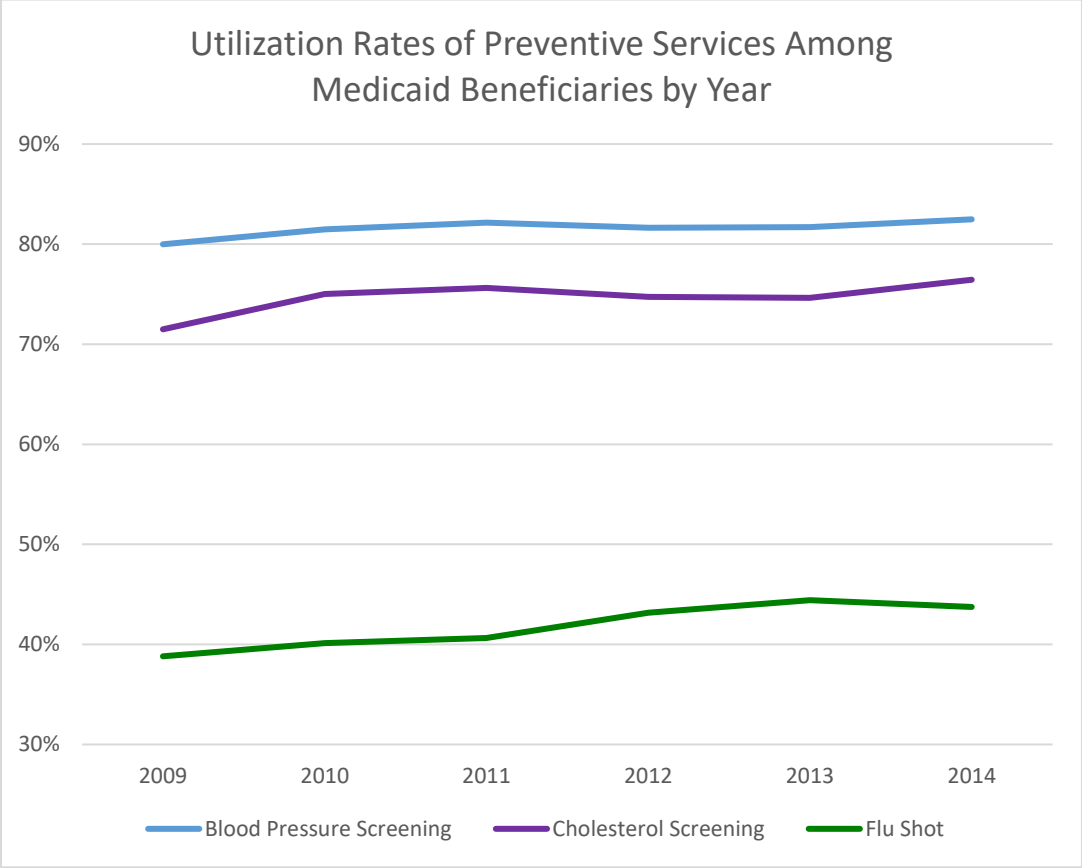
Figure 3.1



Notes:

1) Data are from Medical Expenditure Panel Survey (2010 and 2013) and Kaiser Family Foundation

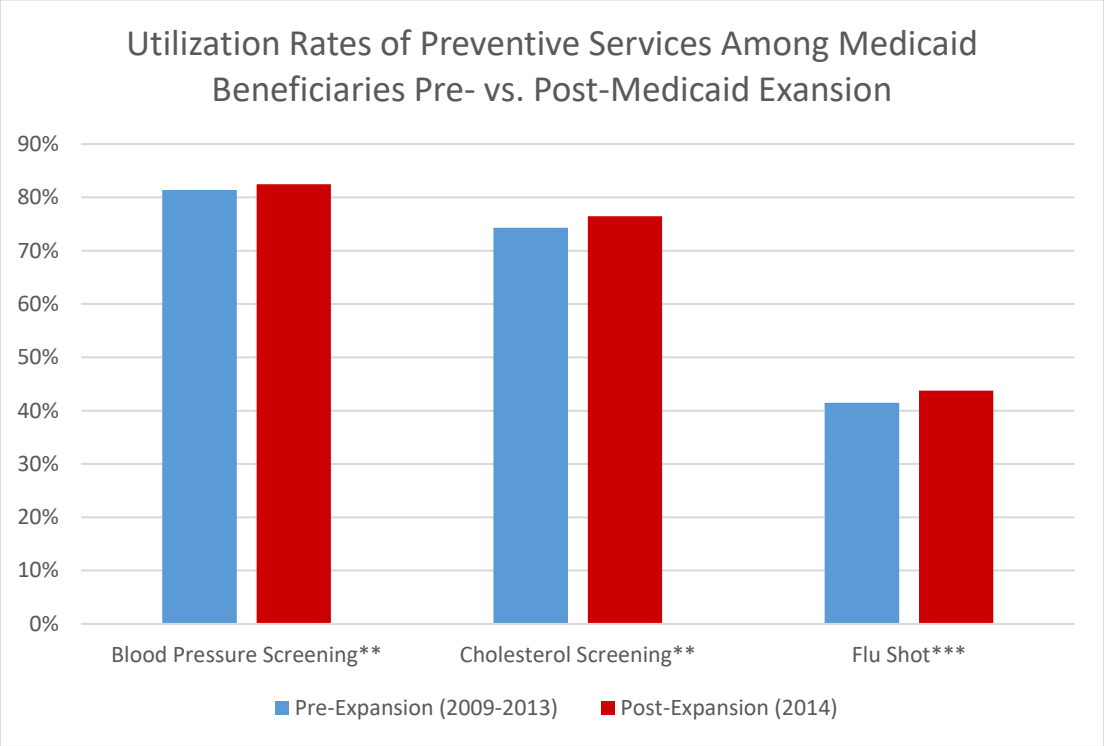
Figure 3.2



Notes:

1) Data are from Medical Expenditure Panel Survey (2009-2014)

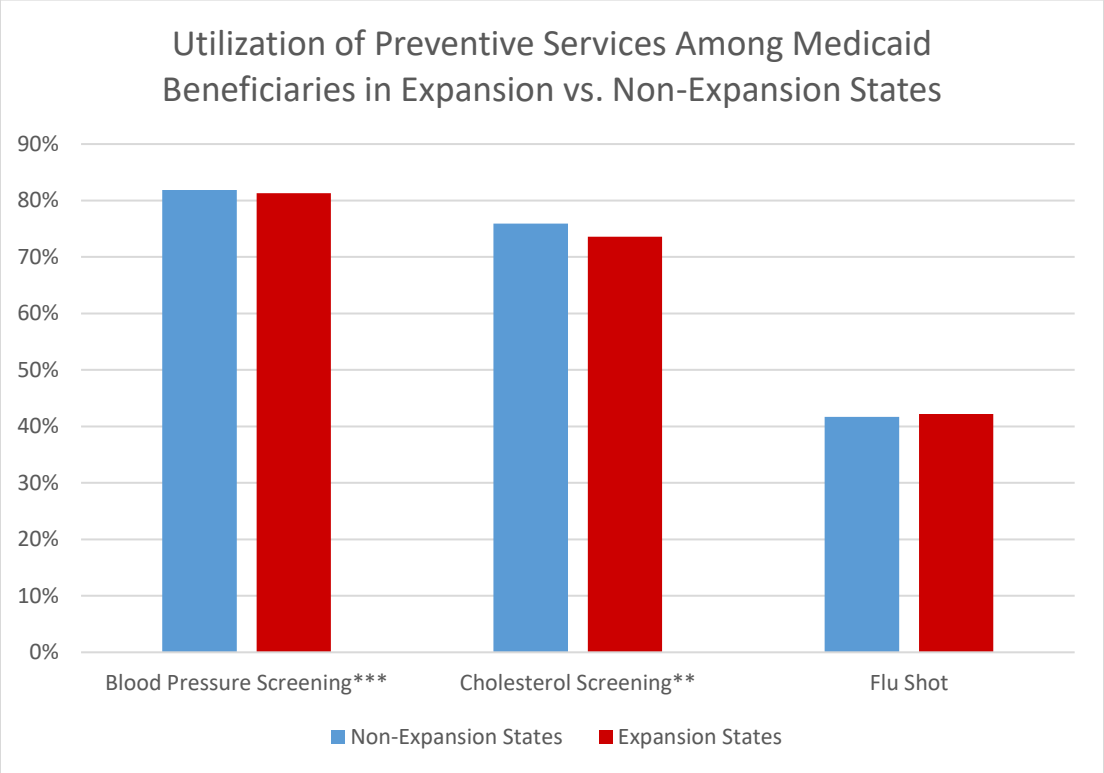
Figure 3.3



Notes:

1) Data are from Medical Expenditure Panel Survey (2009-2014)
2) *p<0.05, **p<0.01, ***p<0.001

Figure 3.4



Notes:

1) Data are from Medical Expenditure Panel Survey (2009-2014)
2) *p<0.05, **p<0.01, ***p<0.001

TABLES

Table 3.1: Model 1 – Logistic Regression Results (Odds Ratios) Examining Association of Medicaid Coverage of and Copay for Preventive Services on Utilization of Preventive Services (MEPS 2010 & 2013)

Variable	Blood Pressure Check	Cholesterol Check	Flu Shot
State Medicaid Policy on Preventive Services			
No Coverage	Ref	Ref	Ref
Covered, with copay	0.43	0.35	6.88***
Covered, without copay	0.31	0.24	6.22***
Age (in years)	1.02**	1.03***	1.02***
Gender			
Male	Ref	Ref	Ref
Female	2.09***	1.22	1.26*
Race and Ethnicity			
White	Ref	Ref	Ref
Black	0.93	1.17	1.12
Asian, Hawaiian, Pacific Islander	0.59	1.58	2.36***
Latino	0.61*	1.23	1.53**
Other Race	0.93	1.45	0.88
Marital Status			
Not Married	Ref	Ref	Ref
Married	0.7*	0.59*	0.97
Income			
Poor (<100% FPL)	Ref	Ref	Ref
Near Poor (100-124% FPL)	0.87	1.65	1.14
Low Income (125-199% FPL)	0.99	1.82*	1.16
Medium & High Income (200+% FPL)	1.12	1.58	1.21
Employment Past Year			
Unemployed Entire Year	Ref	Ref	Ref
Employed at any time	1.07	1.51	1.68
Education			
No high school diploma	Ref	Ref	Ref
High school diploma or higher	0.83	0.99	0.94
Chronic Conditions			
None	Ref	Ref	Ref
One	1.62**	1.48	1.94***
Multiple	4.52***	3.89***	2.79***
Self-Reported Health Status			
Poor, Fair, or Good	Ref	Ref	Ref
Excellent or very good	0.57***	0.75	1.11
Metropolitan Statistical Area			
Non-MSA	Ref	Ref	Ref
MSA	1.5	2	0.86
Interview Language			
Non-English	Ref	Ref	Ref

Variable	Blood Pressure Check	Cholesterol Check	Flu Shot
English	1.02	0.998	0.86
Year Indicator			
2010	Ref	Ref	Ref
2013	1.19	1.04	1.22
Constant	5	0.17*	0.06***
State Indicator	Controlled	Controlled	Controlled

Notes:

1) Data are from Medical Expenditure Panel Survey (2010 and 2013) and Kaiser Family Foundation
2) *p<0.05, **p<0.01, ***p<0.001

Table 3.2: Model 2 – Difference-in-Differences Linear Probability Regression Results Examining the Effect of Medicaid Expansion on Utilization of Preventive Services (MEPS 2009-2014)

	Blood Pressure Check	Cholesterol Check	Flu Shot
Medicaid Expansion Status			
Non-Expansion State	ref	ref	ref
Expansion State	0.02	-0.01	-0.11
Year indicator			
Pre-Expansion (2009-2013)	ref	ref	ref
Post-Expansion (2014)	0.02	0.04	0.07*
Difference-in-Differences Estimate			
Expansion State*Post-Expansion (2014)	-0.008	-0.021	-0.06
Age (in years)	0.001***	0.003***	0.004***
Gender			
Male	ref	ref	ref
Female	0.072***	0.022*	0.053***
Race and Ethnicity			
White	ref	ref	ref
Black	0.009	0.048**	0.012
Asian, Hawaiian, Pacific Islander	-0.048*	0.056*	0.138***
Latino	-0.019	0.05*	0.068**
Other Race	-0.022	0.033	-0.008
Marital Status			
Not Married	ref	ref	ref
Married	-0.008	-0.027	-0.017
Income			
Poor (<100% FPL)	ref	ref	ref
Near Poor (100-124% FPL)	-0.006	0.029	0.016
Low Income (125-199% FPL)	0.011	0.024	0.029*
Medium & High Income (200+% FPL)	0.022	0.035*	0.047*
Employment Past Year			
Unemployed Entire Year	ref	ref	ref
Employed at any time	0.008	0.091	0.038
Education			
No high school diploma	0.004	0.007	-0.013
High school diploma or higher	0.004	0.007	-0.013
Chronic Conditions			
None	ref	ref	ref
One	0.095***	0.147***	0.091***
Multiple	0.165***	0.279***	0.205***
Self-Reported Health Status			
Poor, Fair, or Good			
Excellent or very good	-0.049***	-0.022	-0.001
Region			
Northeast	ref	ref	ref
Midwest	-0.105***	-0.172***	0.099**
South	-0.109***	-0.162***	0.036
West	-0.031	-0.313***	-0.574*

	Blood Pressure Check	Cholesterol Check	Flu Shot
Metropolitan Statistical Area			
Non-MSA	ref	ref	ref
MSA	0.03*	0.085**	-0.007
Interview Language			
Non-English	ref	ref	ref
English	0.022	0	-0.022
Constant	0.759***	0.419***	0.092
State Indicator	Controlled	Controlled	Controlled

Notes:

1) Data are from Medical Expenditure Panel Survey (2009-2014) and Kaiser Family Foundation
2) *p<0.05, **p<0.01, ***p<0.001

Table 3.3: Model 3 – Difference-in-Difference-in-Differences Linear Probability Regression Results Examining the Effect of Medicaid Expansion on Utilization of Preventive Services Among Vulnerable Populations (MEPS 2009-2014)

Model 3a: D-D-D Income	Blood Pressure Check	Cholesterol Check	Flu Shot
Difference-in-Difference-in-Differences Estimator			
Expansion State *Post-Expansion (2014) *Near poor (100-124% FPL)	0.039	-0.077	0.244**
Expansion State *Post-Expansion (2014) *Low Income (125-199% FPL)	-0.026	-0.019	0.086
Expansion State *Post-Expansion (2014) *Medium & High Income (200+% FPL)	-0.031	-0.124	-0.161
Medicaid Expansion Status			
Non-Expansion State	Ref	Ref	Ref
Expansion State	0.013	-0.015	-0.1
Year indicator			
Pre-Expansion (2009-2013)	Ref	Ref	Ref
Post-Expansion (2014)	0.002	0.002	0.089**
Income			
Poor (<100%FPL)	Ref	Ref	Ref
Near Poor (100-124%FPL)	-0.014	0.001	0.046
Low Income (125-199% FPL)	-0.004	0.028	0.036
Medium & High Income (200+% FPL)	0.004	0.016	0.055
Expansion*Year			
Expansion State*Post-Expansion	-0.003	0.01	-0.072
Expansion*Income			
Expansion State *Near poor (100-124%FPL)	-0.001	0.029	-0.047
Expansion State *Low Income (125-199% FPL)	0.021	-0.014	-0.004
Expansion State *Medium & High Income (200+% FPL)	0.021	0.021	0.002
Year*Income			
Post-Expansion (2014) *Near poor (100-124% FPL)	0.019	0.102*	-0.166*
Post-Expansion (2014) *Low Income (125-199% FPL)	0.025	0.036	-0.081
Post-Expansion (2014) *Medium & High Income (200+% FPL)	0.044	0.115*	0.067
Model 3b: D-D-D Race	Blood Pressure Check	Cholesterol Check	Flu Shot
Difference-in-Difference-in-Differences Estimator			
Expansion State *Post-Expansion (2014) *Black	0.116**	-0.009	0.093

Expansion State *Post-Expansion (2014) *Asian, Hawaiian, Pacific Islander	-0.02	-0.032	0.346*
Expansion State *Post-Expansion (2014) *Latino	-0.002	-0.084	0.139*
Expansion State *Post-Expansion (2014) *Other Race	0.154	0.184	0.087
Medicaid Expansion Status			
Non-Expansion State	Ref	Ref	Ref
Expansion State	0.022	-0.019	-0.095
Year indicator			
Pre-Expansion (2009-2013)	Ref	Ref	Ref
Post-Expansion	0.022	0.033	0.109*
Race and Ethnicity			
White	Ref	Ref	Ref
Black	0.013	0.033	0.012
Asian, Hawaiian, Pacific Islander	-0.033	0.059	0.264***
Latino	-0.029	0.023	0.041
Other Race	-0.03	0.078	0.042
Expansion*Year			
Expansion State*Post-Expansion (2014)	-0.044	-0.002	-0.129*
Expansion*Race			
Expansion State*Black	-0.02	0.022	-0.002
Expansion State *Asian, Hawaiian, Pacific Islander	-0.023	-0.000003	-0.157*
Expansion State*Latino	0.008	0.049	0.031
Expansion State*Other race	-0.024	-0.075	-0.051
Year*Race			
Post-Expansion (2014)*Black	-0.032	0.021	-0.051
Post-Expansion (2014) *Asian, Hawaiian, Pacific Islander	0.049	0.024	-0.237
Post-Expansion (2014)*Latino	0.022	0.015	-0.098
Post-Expansion (2014)*Other race	0.005	-0.095	-0.126

Notes:

1) Data are from Medical Expenditure Panel Survey (2009-2014) and Kaiser Family Foundation
2) *p<0.05, **p<0.01, ***p<0.001

Chapter 4: Effect of Primary Care Utilization on Potentially Preventable Hospitalizations – Evidence from the Maryland Medical Care Database

INTRODUCTION

Chronic Conditions and Primary Care

Chronic diseases are the leading cause of morbidity and mortality in the United States and can result in high levels of healthcare expenditures. In 2010, chronic diseases accounted for 70% of causes of death in the United States (CDC, 2014), and in 2012, approximately 50% of adults (117 million people) had at least one chronic disease (Ward, Schiller, & Goodman, 2014). Chronic disease related illnesses made up 86% of all healthcare expenditures in 2010 (Gerteis et al., 2014), and healthcare expenditures accounted for 17.4% of Gross Domestic Product spending in the United States in 2013 (Hartman, Martin, Lassman, & Catlin, 2015).

Access to primary care and preventive services can potentially help curb the cost associated with chronic disease (CDC, 2013). Early screening and detection can prevent chronic diseases from worsening and sometimes from occurring all together, which could help curb the costs associated with chronic conditions in some cases (CDC, 2013). It is estimated that if more people utilized preventive services, two million life years could be saved annually (Maciosek, Coffield, Flottemesch, Edwards, & Solberg, 2010). However, in the US, only about 3 cents of every dollar are spent on prevention (Kemp et al., 2012).

It is well established in the literature that patient cost-sharing, such as copay, can affect the utilization of preventive services (Solanki & Schauffler, 1999). Many people do not have timely access to or cannot afford necessary preventive care

(Cheung, Wiler, Lowe, & Ginde, 2012; Meissner, Klabunde, Breen, & Zapka, 2012), even if a service is covered under an insurance plan. To overcome this access barrier, the ACA stipulates that all private insurance plans purchased beginning in 2010 must cover all USPSTF A and B level preventive services at no cost-sharing to the patient. Studies have shown that among the privately insured, this preventive service coverage mandate had a positive effect on preventive services recommended on an annual basis (such as blood pressure check and flu shot) (Han, Robin Yabroff, Guy, Zheng, & Jemal, 2015), but had limited effect on cancer screenings, which are not recommended on an annual basis (Mehta et al., 2015).

Prevention Quality Indicators: Measuring Primary Care Effectiveness

Getting people covered is just the first step. Even with 100% insurance coverage, how does one know if these services are making a difference in health outcomes? The Agency of Healthcare Research and Quality (AHRQ) has developed Prevention Quality Indicators (PQIs) that focus on inpatient ambulatory care sensitive conditions (ACSCs). An ACSC is a condition that could have been avoided or prevented from becoming more severe with proper ambulatory (e.g., outpatient or preventive) care (Agency of Healthcare Research and Quality [AHRQ], 2002). ACSCs offer a way for healthcare providers, researchers, and policy makers to measure the effectiveness of primary care over time, regions, demographic categories, and providers (AHRQ, 2002). The AHRQ PQIs consist of 13 measures, including: diabetes short-term complication, perforated appendix, diabetes long-term complication, chronic obstructive pulmonary disease or asthma in older adults, hypertension, heart failure, low birth weight, dehydration, bacterial pneumonia,

urinary tract infection, uncontrolled diabetes, asthma in younger adults, and lower-extremity amputation among patients with diabetes (AHRQ, 2002). These indicators allow identification of need levels, resources, and intervention progress monitoring (AHRQ, 2002).

Ambulatory Care Sensitive Conditions and Preventive Services

Literature indicates that lack of primary care is one of the major predictors for ACSC hospitalizations. A systematic review of the relationship between primary healthcare and chronic disease ACSCs found that an increase in primary healthcare resulted in a significant decrease in ACSCs, even after controlling for health status (Gibson, Segal, & McDermott, 2013). Another review found that the relationship between primary care and ACSC hospitalizations varied geographically, with areas with more access to primary care resources having fewer ACSCs hospitalizations (Rosano et al., 2013), further strengthening the relationship between the two. This relationship between primary care and ACSCs is so strong that there have even been studies that use ACSC hospitalizations a markers of primary healthcare efficacy (Caminal, Starfield, Sanchez, Casanova, & Morales, 2004).

Disparities in Ambulatory Care Sensitive Conditions

Both racial and ethnic minorities and low-income individuals experience poorer health and health outcomes compared to their White and higher income counterparts, including rates of ACSCs. Race and ethnicity are predictors of greater amounts of preventable hospitalizations for some ACSCs, but not all (O'Neil et al., 2010). In a study examining predictors of ACSC hospitalizations in South Carolina,

minority, low-income, and rural populations experienced significantly higher rates ACSC hospitalizations (Shi, Samuels, Pease, Bailey, & Corley, 1999). Johnson et al. found that ACSC ED visits were related to being female, a racial/ethnic minority, older, covered by public insurance, and from a low-income neighborhood (Johnson et al., 2012).

It is important to note that racial disparities for ED utilization for chronic ACSCs cannot be explained by differences in disease prevalence or severity, but rather lack of ongoing primary care (Oster & Bindman, 2003). A study found that racial disparities in ED ACSC visits persist even when controlling for gender, age, and non-ACSC admission rates (Laditka, Laditka, & Mastanduno, 2003). In sum, the majority of studies found that the racial disparities in hospitalizations and ED visits for ACSCs were due to lack of adequate and ongoing primary care, even when other factors were taken into account (O'Neil et al., 2010; Shi et al., 1999).

In addition to individual characteristics, ACSC hospitalizations have been shown to be associated with certain area-level characteristics. A study using data from a public hospital system in Texas found that lower-income zip codes were associated with higher rates of ACSCs (Djojonegoro, Aday, Williams, & Ford, 2000). Another study showed that although disparities in rates of ACSC between low- and high-poverty neighborhoods decreased from 2008-2013, high-poverty neighborhoods still had ACSC rates two to four times higher than low-poverty neighborhoods in 2013 (Bocour & Tria, 2016). Finally, a statistical brief on PQI rates using data from the Healthcare Cost and Utilization Project found that in 2005-2011, rural areas had much higher rates of PQIs than less urban areas (Torio & Andrews, 2006).

Disparities in Preventive Care

Economically disadvantaged populations have been shown to have poorer access to preventive services than high-income populations. For example, a study of the utilization of six preventive services (HIV test, smoking cessation discussion, flu shot, pneumococcal vaccination, tetanus vaccination, and zoster vaccination) using NHIS data from 2011-2012 found that those with income >200% FPL were more likely to receive all services but HIV test (Fox & Shaw, 2014). A similar study examining blood pressure screening, cholesterol screening, colon cancer screening, diet counseling, blood sugar check, hepatitis A vaccination, hepatitis B vaccination, mammogram, and pap smear found that those with incomes >200% FPL were significantly more likely to receive all services, except for hepatitis A vaccination (Fox & Shaw, 2015).

Racial and ethnic minorities face substantial disparities in access to care and health outcomes. Non-Latino Blacks (DHHS, 2016b), Asians (DHHS, 2014a), and Latinos (DHHS, 2015a) have lower rates of health insurance and experience higher rates of morbidity and mortality than non-Latino Whites. Research has shown evidence that ACA can reduce health disparities (Chen et al., 2016). On the other hand, research has also shown that minorities often have higher rates of preventive service utilization than non-Latino Whites (Holden, Chen, & Dagher, 2015).

Study Objectives

In this study, I address four research objectives: 1) whether primary care has an effect on the odds of having an ACSC hospitalization among those hospitalized; 2) whether primary care has an effect on the odds of having any hospitalization and the

odds of having an ACSC hospitalization among those with and without a hospitalization; 3) whether there are any lag effects in the relationship between primary care and the odds of having any hospitalization and the odds of having an ACSC hospitalization, and 4) What individual and community characteristics are associated with the odds of having an ACSC hospitalization. Specifically, I hypothesize that receiving primary care (either during the same year or with a one year lag) will decrease the odds of having any hospitalization and an ACSC hospitalization. I further hypothesize that that there will be a lag effect of primary care on the odds of having an ACSC hospitalization, meaning that primary care use recently and in the past will decrease odds of having any hospitalization and an ACSC hospitalization. Finally, I hypothesize that living in an area with higher incomes, education levels, and access to care and lower levels of racial and ethnic minorities will be associated with a decrease in the odds of having any hospitalization and an ACSC hospitalization. The strengths of this study include the use of all payer, panel data, which allows tracking individuals over time, as well as merging the all payer date with contextual factors at the zip code- and county-level.

METHODS

Data

I used the Maryland Medical Care Database (MCDB), administered by the Maryland Healthcare Cost Commission, for the years 2012-2014. The state of Maryland requires that all insurance payers report their claims data to the MCDB (MD Health-General Article §§ 19-133). The MCDB contains information for all commercially insured individuals in the state of Maryland and is comprised of four

files per year of data: eligibility, institutional services, professional services, and prescriptions. The eligibility file contains information about the insured individual, including type of insurance plan and demographic information. The institutional services file contains information on inpatient and outpatient hospital visits, including diagnosis codes, procedure codes, and detailed information on expenditures. The professional services file contains information about physician office visits, and it also includes diagnosis codes, procedure codes, and detailed information on expenditures. MCDB includes a unique patient identifier, which can be used to link individuals by different files and across years. I linked demographic characteristics from the eligibility file with primary care utilization from the professional services file and ACSCs and chronic conditions from the institutional services file.

The MCDB does not include information about income and education level, and only contains very limited information about race and ethnicity. Hence, to get the proxies of demographic and socioeconomic status of the enrollees, I merged MCDB with the zip code-level demographic data from the American Community Survey (ACS; 2013) and county-level data from the Area Health Resources File (AHRF; 2012). The ACS is operated by the United States Census Bureau, and provides accurate, up to date measurements of the United States population and its characteristics. The ACS includes variables on demographics, socioeconomic status, and even some health access variables. The AHRF is operated by the Agency for Healthcare Research & Quality (AHRQ) and provides county level statistics on a variety of healthcare access measures, such as number of facilities and providers.

Sample

The MCDB contains data on commercially insured individuals who used healthcare in the state of Maryland from 2012-2014. To see trends over time, I started with all adults in year 2012 (n=4,513,720). Next, I merged patient IDs from the 2012 data onto the 2013 data, and I kept only those in 2013 who were in the 2012 data (n=1,184,993). I repeated this process by merging the patient IDs that were in both 2012 and 2013 to the 2014 data and kept only those who were present in all three years of data (n=839,328). Finally, I appended the three years together into my panel data structure that contained three years of observations for each of my 839,328 individuals. See Figure 4.1 for a visualization of this process.

Dependent Variables

The main dependent variables of interest in my study were 1) an ACSC hospitalization indicator variable among those hospitalized, and 2) whether an individual had a hospitalization, and if so, whether it was an ACSC hospitalization. I used the AHRQ PQI guidelines to generate an indicator variable for each of 12 ACSCs (not including low birth weight). For each inpatient admission, an indicator variable was constructed for each ACSC (non-ACSC admission* versus ACSC admission). I then summed this admission-level variable by patient and created a patient-level indicator of each ACSC. I also generated an individual-level categorical variable for hospitalization and ACSC status (no hospitalization* versus non-ACSC hospitalization and ACSC hospitalization).

Key Independent Variables

My main independent variable of interest is whether the individual received any primary care. From the professional services file, I used Current Procedural Terminology (CPT) codes indicated for primary care (99381-99429), as well as six Healthcare Common Procedure Coding System (HCPCS) codes for primary care (G0402, G0438, G0439, S0601, S0612, and S0613), to generate an indicator variable for primary care for each record (non-primary care* versus primary care). Similar to my ACSC variables, I summed this variable by patient and created a patient-level indicator variable for primary care.

Other Independent Variables

From the MCDB, I controlled for several individual-level variables, including age (in years), sex (male* versus female), type of insurance plan (individual market* versus private employer sponsored or other group insurance, public employee insurance [federal and non-federal], comprehensive standard health benefit plan, and other type of plan), whether an insurance plan was a health maintenance organization (non-HMO* versus HMO), and number of chronic conditions (no chronic conditions* versus one chronic condition and multiple chronic conditions). At the zip code-level, I used several demographic, socioeconomic, and health access variables from the ACS, including percent unemployed, percent uninsured, percent Hispanic, percent White, percent with a high school degree or above, percent of total population living in poverty, percent not a US citizen, and percent do not speak English at home. Then, at the county-level, I included several health access and outcome measures from AHRF, including number of primary care physicians per 1,000 population, number of

specialty physicians per 1,000 population, number of federally qualified health centers per 1,000 population, and number of hospitals per 1,000 population.

Analysis

I used Stata 14 to conduct all analyses. I first examined and compared individual and community characteristics over whether the patient had an inpatient hospital visit, and if so whether that visit was an ACSC hospitalization. Given the panel data structure, I used panel logistic regression (*xtlogit*) and panel ordered logistic regression (*xtologit*) techniques to examine my research objectives. Four models were tested, two panel logistic regression models and two panel ordered logistic regression models, with and without controlling for a lag effect in primary care. Each model contained 3 sub-models, a) unadjusted, b) adjusted with individual characteristics, and c) adjusted with individual and contextual (zip code- and county-level) characteristics.

Model 1 used panel logistic regression to examine the effect of primary care on the odds of whether a hospitalization was an ACSC among those with a hospitalization. The dependent variable for Model 1 was an ACSC indicator variable (non-ACSC admission* versus ACSC admission). Model 2 was identical to Model 1, except I used a primary care lag indicator variable to examine the effect of the receipt of primary care in the previous year on the odds of a having an ACSC hospitalization. For my unadjusted panel logistic regression Models 1a and 2a, I used a Hausman Test to determine if a random effects model was appropriate, versus the alternative of using a fixed effect model. Fixed effect models are useful when independent or dependent variables could be influenced by individual characteristics of the

observations that may or may not be measured. In my case, whether someone received primary care or had an ACSC hospitalization could be influenced by variables I do not have in my data, such as race and ethnicity, income, and education. Fixed effects models can correct for this bias that individual characteristics may have on other variables in your model. The Hausman Test determined that fixed effects was preferred over random effects in both cases (Model 1a $p<0.001$ and Model 2a $p=0.027$).

Next, I used Model 3 to evaluate the effect of preventive care on the odds of having any hospitalization and the odds of having an ACSC hospitalization. Model 3 was a panel ordered logistic regression model that included my entire sample, not just those who had a hospitalization in a given year. The dependent variable in Model 3 was a categorical variable reflecting hospitalization and ACSC status (no hospitalization* versus non-ACSC hospitalization and ACSC hospitalization). Model 4 was identical to Model 3, except I also included a primary care lag indicator variable to examine the effect of primary care in the previous year on odds of having any hospitalization and the odds of having an ACSC hospitalization.

Since I used panel data in my analyses, I was concerned that there may be issues of autocorrelation (also known as serial or lag correlation), meaning that the variables in my models may not vary randomly by panel over time, but rather may be correlated with previous values of themselves among the same individuals. For example, if someone had an ACSC hospitalization in 2013, this could be correlated with whether they had an ACSC hospitalization in 2014, which could bias results. I tested for autocorrelation using the *xtserial* command in Stata, and found that each

sub-model exhibited autocorrelation. Therefore, to correct for autocorrelation in my models, I used the *vce(robust)* command to include robust standard error estimates.

RESULTS

Population Characteristics

Overall, my sample consisted of 839,328 commercially insured individuals who had utilized healthcare in Maryland in 2012, 2013, and 2014 (total = 2,517,984 records; See Table 4.1). Of this sample, 4.3% (n=108,403) had a hospitalization. Of those with a hospitalization, 8.21% (n=8,900) had an ACSC hospitalization (See Figure 4.2), and 91.79% (n=99,503) did not. In total, 32.01% of my population received primary care (See Figure 4.3), with 32.27% of those with no hospitalization receiving primary care, 26.87% of those with a non-ACSC hospitalization receiving primary care, and 19.25% of those with an ACSC hospitalization receiving primary care. In terms of individual-level demographics, my sample was an average of 46.01 years old and was 51.67% female. Eleven percent of my sample had HMO plans, 62% had private employer sponsored insurance, and 70% had multiple chronic conditions. My sample came from zip codes with an average of 9% living in poverty, 5% unemployment rate, 10% uninsured rate, 90% high school graduation rate, 52% citizenship rate, 60% White population, 9% Latino population, and 17% non-English speaking populations. Additionally, my sample came from counties with an average of 0.88 primary care physicians per 1,000 population, 1.46 specialty physicians per 1,000 population, 0.01 federally qualified health centers per 1,000 population, and 0.01 hospitals per 1,000 population. My sample differed significantly on all

characteristics by whether their hospitalization qualified as an ACSC, except for individual insurance type.

Model 1 – Panel Logistic Regression Results

In my Model 1, I used panel logistic regression to examine the effect of primary care on whether a hospitalization was an ACSC hospitalization. In Model 1a, which was a fixed effects panel logistic regression model, I see that, among those who were hospitalized in Maryland during 2012-2014, primary care did not affect the odds of having an ACSC hospitalization (See Table 4.2). In Model 1b, I see that when controlling for individual characteristics, primary care decreased the odds of having an ACSC hospitalization by 26%. The odds of having an ACSC hospitalization increased by 3% for each year increase in age, and decreased by 26% by being female. Additionally, having an HMO plan was associated with a 22% increase in the odds of having an ACSC hospitalization, and having either private employer, public employer, or other type of insurance was associated with an increase in odds of having an ACSC hospitalization. Finally, having one chronic condition nearly doubled the odds of having an ACSC hospitalization, and having multiple chronic conditions more than doubled the odds of having an ACSC hospitalization.

Model 1c, which examined the effect of primary care on the odds of having an ACSC hospitalization among those hospitalized while controlling for individual and contextual factors, found that primary care was associated with a 23% decrease in the odds of having any hospitalization. Similar to Model 1b, I see that being female was significantly associated with a decrease in odds of having an ACSC hospitalization, and age and having an HMO plan were significantly associated in an increase in the

odds of a having an ACSC hospitalization. Private employer and other insurance plan type were both associated with an increase in odds of having an ACSC hospitalization, compared to individual insurance plan, and having any chronic diseases was significantly associated with an increase in the odds of having an ACSC hospitalization. Additionally, I found that each percentage point increase in zip code population of non-Latino Whites was associated with a 1% decrease in the odds of having an ACSC hospitalization. Each percentage point increase in zip code population of high school education was associated with a 3% decrease in the odds of having an ACSC hospitalization, and each percentage point increase in zip code population that does not speak English at home was associated with a 2% decrease in the odds of having an ACSC hospitalization. Finally, for every additional specialist per 1,000 county population, the odds of having an ACSC hospitalization decreased by 7%. I did not see any significant association between the odds of having an ACSC hospitalization and zip code percent population in poverty, unemployed, uninsured, Hispanic, or not a US citizen or number of primary care physicians, hospitals, and federally qualified health centers per 1,000 county population.

Model 2 – Panel Logistic Regression Results Including Primary Care Lag Effects

My Model 2 used panel logistic regression to evaluate the effect of primary care on the odds of having an ACSC hospitalization among those who were hospitalized, including a one year lag in primary care. In Model 2a, my unadjusted fixed effects model, I found that primary care did not affect odds of having an ACSC hospitalization (See Table 4.3). In Model 2b, controlling for individual characteristics, I found that having primary care in the same year as a hospitalization

decreased the odds of having an ACSC hospitalization by 17%, and having primary care in the year before a hospitalization decreased the odds of having an ACSC hospitalization by 38%. Each year of age was associated with a 4% increase in the odds of having an ACSC hospitalization, and being female was associated with a 30% decrease in the odds of having an ACSC hospitalization. For insurance plan type, private employer, public employer, comprehensive standard benefit plans, and other type of insurance were significantly associated with an increase in the odds of having an ACSC hospitalization, compared to individual insurance policies, and having an HMO plan was associated with an increase in the odds of having an ACSC hospitalization. Having any chronic condition was associated with a 70% increase in the odds of having an ACSC hospitalization, compared to having no chronic conditions.

In Model 2c, where I controlled for both individual and contextual factors, I found that receiving primary care in the same year as a hospitalization decreased the odds of having an ACSC hospitalization by 13%, and receiving primary care the year before a hospitalization decreased the odds of having an ACSC hospitalization by 36%. For control variables, I saw similar trends as in Model 2b. Additionally, for every 1% increase in zip code population of Non-Latino Whites or people who do not speak English at home, the odds of having an ACSC hospitalization increased by 1%, and for every 1% increase in zip code population with a high school education or higher, the odds of having an ACSC hospitalization increased by 2%. I do not see any significant association between any county-level characteristics or zip code percent

population in poverty, unemployed, Hispanic, and not a US citizen and the odds of having an ACSC hospitalization.

Model 3 – Panel Ordered Logistic Regression Results

In my Model 3, I used a panel ordered logistic regression model to evaluate the effect of primary care on 1) the odds of having any hospitalization, compared to having no hospitalization, and 2) the odds having an ACSC hospitalization compared to having a non-ACSC hospitalization or not having a hospitalization at all (See Table 4.4). In Model 3a, which is unadjusted, I saw that primary care decreased the odds of having any hospitalization and the odds of having an ACSC hospitalization by 26%. In Model 3b, where I adjust for individual-level characteristics, I found that primary care decreased the odds of having any hospitalization and the odds of having an ACSC hospitalization by 23%. Control variables were mostly similar to previous models, where being female and having any type of insurance other than an individual plan being associated with an increase in the odds of having any hospitalization and the odds of having an ACSC hospitalization. I also saw that having an HMO plan was associated with a decrease in the odds of having any hospitalization and the odds of having an ACSC hospitalization. Having one chronic disease more than doubled the odds of having any hospitalization and the odds of having an ACSC hospitalization, compared to having no chronic conditions, but having multiple chronic conditions was associated with a 90% decrease in the odds of having any hospitalization and the odds of having an ACSC hospitalization, compared to those with no chronic conditions. I do not see an association between age and the odds of having any hospitalization and having an ACSC hospitalization.

Model 3c, which included individual and contextual control variables, found that primary care decreased the odds of having any hospitalization or an ACSC hospitalization by 23%. Individual control variables were similar to those in Model 3b. In terms of contextual variables, an increase in zip code population that were in poverty, unemployed, uninsured, Hispanic, White, and had a high school degree or higher was associated with a decrease in the odds of having any hospitalization and the odds of having an ACSC hospitalization, and an increase in the zip code population that were not US citizens was associated with an increase in the odds of having any hospitalization or an ACSC hospitalization. Additionally, an increase in the number of primary care physicians, hospitals, and federally qualified health centers per 1,000 county population was associated with a decrease in the odds of having any hospitalization and the odds of having an ACSC hospitalization, and an increase in the number of specialists per 1,000 county population was associated with an increase in the odds of having any hospitalization or an ACSC hospitalization. I did not observe any association between the zip code percent population of those not speaking English at home and the odds of having any hospitalization and the odds of having an ACSC hospitalization.

Model 4 – Panel Ordered Logistic Regression Results Including Primary Care Lag Effects

In Model 4, I used a panel ordered logistic regression model to evaluate the effect of primary care during the same year and primary care in the previous year on the odds of 1) having any hospitalization, compared to having no hospitalization, and 2) the odds of having an ACSC hospitalization compared to having a non-ACSC

hospitalization or having no hospitalization at all. In Model 4a, which is unadjusted, I saw that receiving primary care in the same year decreased the odds of having any hospitalization and the odds of an ACSC hospitalization by 38%, and receiving primary care in the previous year decreased the odds of having any hospitalization and the odds of having an ACSC hospitalization by 18% (See Table 4.5). In Model 4b, where I control for individual factors, I saw similar trends to Model 4a, where receiving primary care in the same year decreased the odds of having any hospitalization and the odds of having an ACSC hospitalization by 33%, and receiving primary care in the previous decreased the odds of having any hospitalization and the odds of having an ACSC hospitalization by 10%.

Control variables in Model 4b were similar to those in previous models, where being female, having an HMO, and having one chronic condition, compared to no chronic conditions all were associated with an increase in the odds of having any hospitalization and having an ACSC hospitalization. Similarly, age and having multiple chronic conditions, compared to no chronic conditions were associated with a decrease in the odds of having any hospitalization and the odds of having an ACSC hospitalization. Having private or public employer sponsored insurance was associated with an increase in the odds of having any hospitalization and the odds of having an ACSC hospitalization compared to having individual insurance. I saw no association between having comprehensive standard benefit insurance or other insurance type, compared to individual insurance and the odds of having any hospitalization and the odds of having an ACSC hospitalization.

Model 4c, which included both individual and contextual factors, found that primary care in the same year decreased the odds of having any hospitalization and the odds of having an ACSC hospitalization by 33%, and receiving primary care in the previous year decreased the odds of having a hospitalization and the odds of having an ACSC hospitalization by 9%. Model 4c individual control variables were similar to Model 4b individual control variables, except that having a comprehensive standard benefit insurance plan was also associated in an increase in the odds of having any hospitalization and an ACSC hospitalization, compared to having an individual insurance plan. In terms of contextual variables, an increase in zip code percent population that was in poverty, was Hispanic, had a high school education or more, and that did not speak English at home was associated with a decrease in the odds of having any hospitalization and the odds of having an ACSC hospitalization, and an increase in zip code percent population that was uninsured and not a US citizen was associated with an increase in the odds of having a hospitalization and the odds of having an ACSC hospitalization. Additionally, an increase in the number of primary care physicians, hospitals, and federally qualified health centers per 1,000 county population was associated with a decrease in the odds of having any hospitalization or an ACSC hospitalization, and an increase in specialists per 1,000 county population was associated with an increase in the odds of having any hospitalization or an ACSC hospitalization.

DISCUSSION

I first hypothesized that, among those with hospitalizations, receiving primary care would be associated with a decrease in the odds of a having an ACSC

hospitalization, and I observed these trends in Models 1b,1c, 2b, and 2c. I did not see any effect of primary care on the odds of having an ACSC hospitalization in my unadjusted fixed effect panel logistic Models 1a and 2a. These findings could indicate that individual characteristics alone are not solely responsible for a significant association between primary care and the odds of having an ACSC hospitalization.

When I compared my sample characteristics by no hospitalizations, non-ACSC hospitalizations, and ACSC hospitalizations, I found that those who had an ACSC hospitalization differed significantly from those who had a non-ACSC hospitalization in all characteristics. However, I observed that receiving primary care was significantly associated with a decrease in odds of having an ACSC hospitalization, even when adjusting for sociodemographic individual and contextual factors.

I also hypothesized that there would be a lag in the effect of primary care on the odds of having an ACSC hospitalization among those with hospitalizations, as well as the odds of having any hospitalization and the odds of having an ACSC hospitalization among my entire sample, and I did see this effect in all of my models that include a primary care lag effect. Interestingly, the effect of primary care in the previous year was different for my panel logistic regression and panel ordered logistic regression models. In the panel logistic regression Model 2, primary care in the previous year was associated with a larger decrease in the odds of having an ACSC among those with a hospitalization than receiving primary care in the same year. Yet, in my panel ordered logistic regression Model 4, primary care in the previous year was associated with a smaller decrease in the odds of having any hospitalization and

the odds of having an ACSC the receiving primary care in the same year. This could be because those who have hospitalizations are more likely to have chronic health conditions in general. Therefore, the ongoing effect of primary care is stronger than the short-term effect of primary care. Meaning that that, for those who are sicker, continual primary care is more beneficial than immediate primary care.

Along a similar line, I saw that in my panel ordered logistic regression Models 3 and Model 4, having one chronic condition dramatically increases the odds of having any hospitalization and the odds of having an ACSC hospitalization, and yet having multiple chronic conditions significantly decreases the odds of having any hospitalization and the odds of having an ACSC hospitalization. This could again be due to those with multiple chronic conditions being more likely to be sicker and having more doctor visits in general. This could mean that they are more likely to receive primary care and/or would have any conditions that could turn into an ACSC hospitalization caught before the situation escalates.

In terms of zip code population characteristics, an increase in the zip code percent population that was White or had a high school degree or higher was associated with a decrease in the odds of having an ACSC hospitalization among those with a hospitalization and a decrease in the odds of having any hospitalization and the odds of having an ACSC hospitalization among my entire population. These findings support my hypothesis, but I also saw that living in poorer zip codes was not associated with the odds of having an ACSC hospitalization among those who were hospitalized, and was associated with a decrease in the odds of having any hospitalization and the odds of having an ACSC hospitalization among my entire

sample. I saw similar trends in zip code percent unemployed and uninsured both being associated with a decrease in the odds of having any hospitalization and the odds of having an ACSC. This could be because of the safety net effect. Even though these individuals are privately insured, they may have more access to free healthcare that they don't need their insurance for if they live in poor neighborhoods.

Interestingly, zip code percent population uninsured was not associated with the odds of having an ACSC among those with a hospitalization. In my Model 3 panel ordered logistic regression model without primary care lag effects, an increase in the zip code population was associated with a decrease in the odds of having any hospitalization and the odds of having an ACSC hospitalization. Yet, in my Model 4, which is identical to Model 3 and includes a one year lag effect of primary care, an increase in the percent zip code population that was uninsured resulted in an increase in the odds of having any hospitalization and the odds of having an ACSC hospitalization. This indicates that primary care continuity is especially important.

In terms of county characteristics among those with a hospitalization, I saw that a decrease in specialists per 1,000 county population was associated with a decrease in the odds of having an ACSC in Model 1c. However, this effect did not continue in my Model 2c, where I saw no association between county characteristics and the odds of having an ACSC hospitalization. In my panel ordered logistic regression Models 3c and 4c, I saw several significant county effects on the odds of having any hospitalization and the odds of having an ACSC hospitalization. In both models, both with and without a primary care lag, I saw that an increase in the number of primary care physicians, hospitals, and federally qualified health centers

per 1,000 county population were all associated with a decrease in the odds of having any hospitalization and the odds of having an ACSC hospitalization, and an increase in specialists per 1,000 county population was associated with an increase in the odds of having any hospitalization and the odds of having an ACSC hospitalization. This makes sense, since previous literature shows a strong connection between access to care, particularly primary care, and the odds of having either hospitalizations or an ACSC hospitalization.

Limitations

My study has several limitations. First, in my Model 1 and Model 2, I only used people who had an inpatient hospital visit. By doing so, I could have missed many people who have been to the doctor and received primary care, but never had an inpatient hospital visit. On the other hand, in my Model 3 and Model 4, I included everyone who used healthcare, not just those who had an inpatient hospitalization. In these models, I could better evaluate the effect of primary care on ACSC hospitalizations. However, since my data were only for healthcare utilization in the state of Maryland, I could have missed the effect of people who live in Maryland but get healthcare out of state. Therefore, I may have been incorrect in assuming that people with no hospitalization and/or no primary care in the state of Maryland did not receive primary care or have a hospitalization. Additionally, utilization of primary care and hospitalizations could be endogenous, which is why I examined multiple outcomes and model specifications.

The ACA stipulated that all private insurance plans purchased starting in 2010 must cover USPSTF A and B recommended preventive services at no cost sharing.

Since my data only go back to 2012, I could not examine the effect of this policy on either receipt of primary care or ACSC hospitalizations. Additionally, I did not know when the insurance plan was purchased and whether it covered preventive care at no cost sharing. Also, since my data only included the privately insured, I could not examine trends by payer type.

Another limitation to my study was that I used the patient as the unit of analysis. By aggregating ACSCs and primary care by patient, I was not able to control for things like hospital fixed effects as I could have if I used admission as the unit of analysis. Finally, I measured primary care and ACSCs by year, but I did not account for the exact dates of primary care versus ACSCs. It is possible that an ACSC happened in February, and primary care was received in August of the same year, which could have biased my effects.

Finally, I did not control for any type of moral hazard in my models. The concept of moral hazard refers to the tendency of individuals to overuse healthcare once insured, since they no longer have to pay costs out of pocket (Geyman, 2007). Ex-ante moral hazard, which refers to individuals being more likely to engage in risky health behavior once insured, since they will no longer be responsible for the full cost of care (Dave & Kaestner, 2009), could have affected my results. It is possible that since all of my sample was insured, they may have either over utilized primary care or may not have felt the need to utilize primary care, since they would not have had to pay the full costs of any potential ACSCs down the line.

CONCLUSION AND POLICY IMPLICATIONS

My results support previous findings that primary care can significantly reduce both hospitalizations and ACSC hospitalizations. I also found that continuous primary care decreased the odds of having any hospitalization and the odds of having and ACSC hospitalization, strengthening the argument for continuity of care. My effects held strong, even when controlling for individual-, zip code-, and county-level characteristics. However, I saw that individual-, zip code-, and county-level sociodemographic characteristics were associated with the odds of having a hospitalization and the odds of having an ACSC. This could indicate that, even with increased access to care through the ACA, disparities in primary care and ACSCs still persist. An effort to increase both access to and utilization of primary care, especially among vulnerable populations and areas with low socioeconomic characteristics, could significantly reduce ACSC hospitalizations and their associated costs.

FIGURES

Figure 4.1: Structure of Dataset

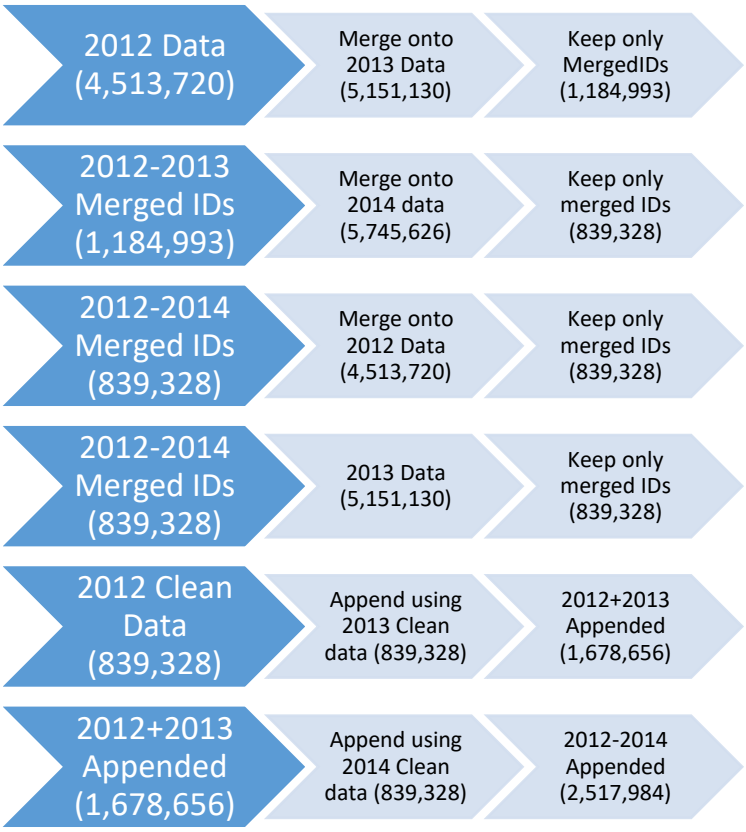


Figure 4.2

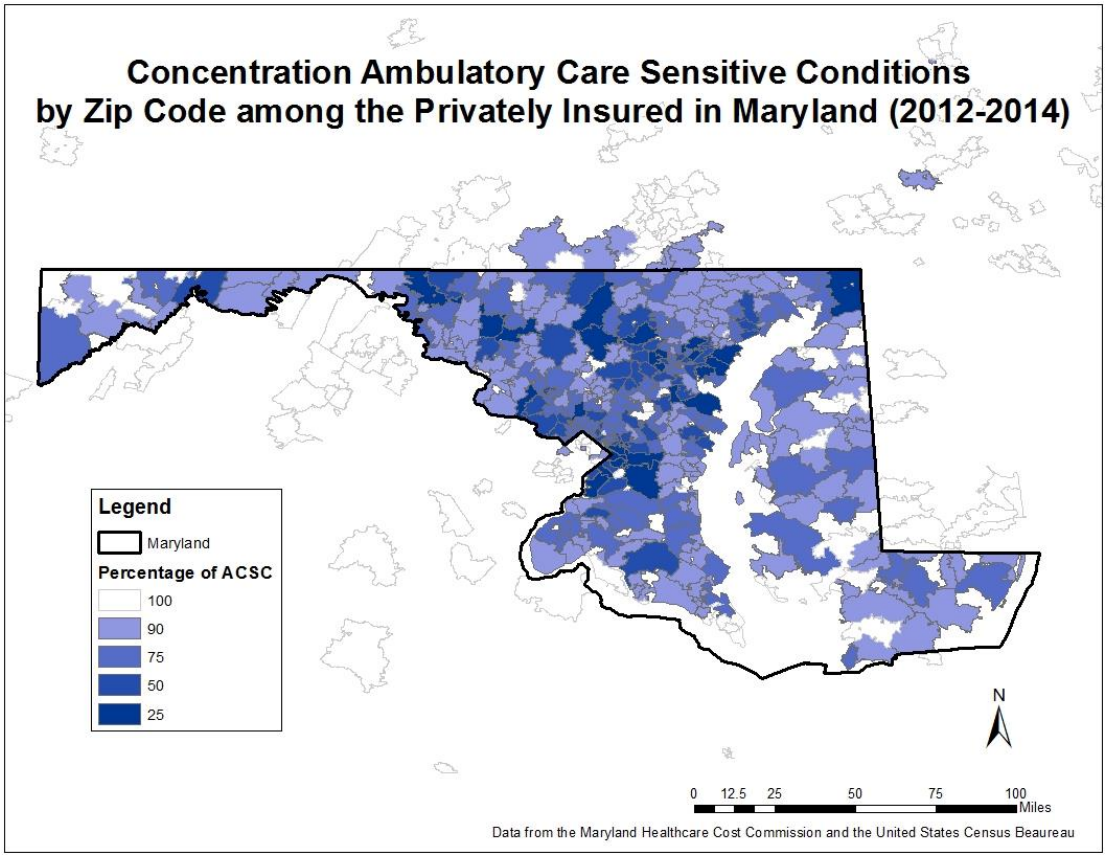
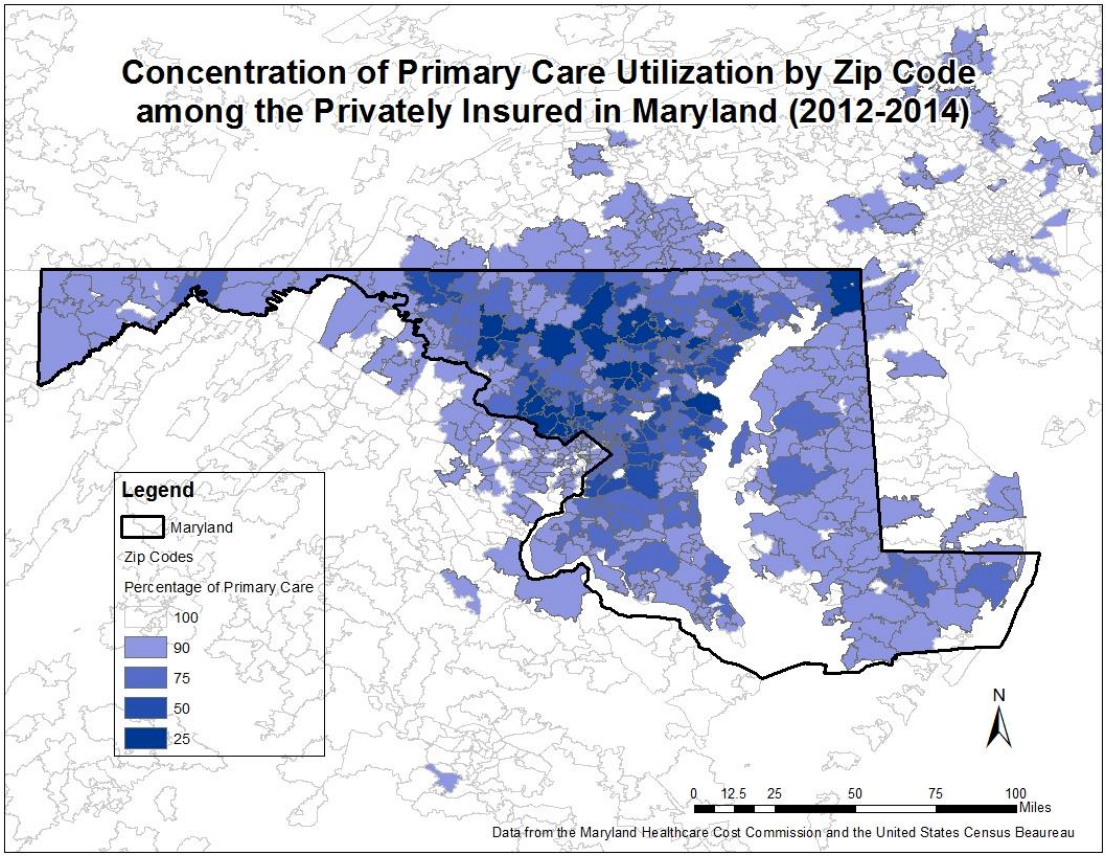

Concentration Ambulatory Care Sensitive Conditions
by Zip Code among the Privately Insured in Maryland (2012-2014)
Legend
Maryland
Percentage of ACSC
100
90
75
50
25
N
0 12.5 25 50 75 100
Miles
Data from the Maryland Healthcare Cost Commission and the United States Census Beaureau

Figure 4.3


Concentration of Primary Care Utilization by Zip Code among the Privately Insured in Maryland (2012-2014)
Legend
Maryland
Zip Codes
Percentage of Primary Care
100
90
75
50
25
N
0 12.5 25 50 75 100
Miles
Data from the Maryland Healthcare Cost Commission and the United States Census Beaureau

TABLES

Table 4.1: Population Characteristics for Individuals in the Maryland Medical Care Database from 2012-2014 (All values percent, unless indicated otherwise)

Level	Variable	Total Population (n=2,517,984)	No Hospitalization (n=2,409,581)	Non-ACSC Hospitalization (n=99,503)	Ambulatory Care Sensitive Conditions (n=8,900)
Individual	Preventive Service Utilization***	32.01	32.27	26.87	19.25
	Age (in years)***	46.01	45.89	47.83	55.33
	Female***	51.67	51.14	63.59	52.86
	HMO***	11.58	11.64	10.02	12.78
	Individual Market	3.78	3.85	2.26	1.48
	Private Employer or Group Plan***	61.78	61.85	60.56	57.21
	Public Employer***	27.06	26.91	30.27	32.35
	Comprehensive Standard Health Benefits***	5.55	5.62	3.94	3.44
	Other***	1.83	1.77	2.98	5.52
	No Chronic Conditions***	27.56	25.74	69.45	51.26
	One Chronic Condition***	2.30	1.89	11.02	17.09
	Multiple Chronic Conditions***	70.14	72.37	19.53	31.65
Zip Code	Percent Population in Poverty***	8.90	8.88	9.11	10.40
	Percent Unemployed***	5.24	5.23	5.35	5.82
	Percent Uninsured***	9.91	9.91	10.00	10.68
	Percent Hispanic***	8.63	8.64	8.35	8.10
	Percent White***	60.44	60.50	59.62	56.10
	Percent High School***	89.97	89.99	89.62	88.29
	Percent Not US Citizen***	47.76	47.73	48.19	49.27
	Percent Don't Speak English at Home***	17.33	17.37	16.73	14.91

Level	Variable	Total Population (n=2,517,984)	No Hospitalization (n=2,409,581)	Non-ACSC Hospitalization (n=99,503)	Ambulatory Care Sensitive Conditions (n=8,900)
County	Primary Care Physicians per 1,000 Population***	0.88	0.88	0.87	0.82
	Specialists per 1,000 Population***	1.46	1.46	1.46	1.38
	Hospitals per 100 Population***	0.01	0.01	0.01	0.01
	Federally Qualified Health Centers per 1,000 Population***	0.01	0.01	0.01	0.01

Notes:

1) Data are from the Maryland Medical Care Database (2012-2014), American Community Survey (2013), and the Area Health Resources File (2012)
2) *p<0.05, **p<0.01, ***p<0.001

Table 4.2: Panel Logistic Regression Result (Odds Ratios) Examining the Effect of Primary Care on the odds of having an Ambulatory Care Sensitive Condition Hospitalization among Those Hospitalized in Maryland in 2012-2014

Variable	Model 1a	Model 1b	Model 1c
Preventive Care Utilization			
No Preventive Care	Ref	Ref	Ref
Preventive Care	1.083	0.739***	0.766***
Age (in years)		1.034***	1.032***
Sex			
Male		Ref	Ref
Female		0.739***	0.729***
HMO Plan Status			
Non-HMO		Ref	Ref
HMO		1.218***	1.159**
Insurance Plan Type			
Individual Plan		Ref	Ref
Private Employer or Group Plan		1.304*	1.296*
Public Employer Plan		1.325*	1.262
Comprehensive Standard Health Benefit Plan		1.126	1.139
Other Plan Type		1.845***	1.829***
Chronic Conditions			
No Chronic Conditions		Ref	Ref
One Chronic Condition		1.94***	1.857***
Multiple Chronic Conditions		2.084***	1.912***
Percent Population in Poverty (Zip Code)			1.0003
Percent Unemployed (Zip Code)			1.004
Percent Uninsured (Zip Code)			0.995
Percent Hispanic (Zip Code)			1.004
Percent White (Zip Code)			0.992***
Percent High School (Zip Code)			0.973***
Percent Not US Citizen (Zip Code)			0.998
Percent Don't Speak English at Home (Zip Code)			0.984***
Primary Care Physicians per 1,000 Population (County)			1.077
Specialists per 1,000 Population (County)			0.928*
Hospitals per 1,000 Population (County)			7.355
Federally Qualified Health Centers per 1,000 Population (County)			4.653
Constant		0.004***	0.122***

Notes:

1) Data are from the Maryland Medical Care Database (2012-2014), American Community Survey (2013), and the Area Health Resources File (2012)
2) *p<0.05, **p<0.01, ***p<0.001

Table 4.3: Panel Logistic Regression Result (Odds Ratios) Examining the Effect of Primary Care on the odds of having an Ambulatory Sensitive Hospitalization among Those Hospitalized in Maryland 2012-2014, Including a One Year Lag Effect of Primary Care

Variable	Model 2a	Model 2b	Model 2c
Preventive Care Status			
No Preventive Care	Ref	Ref	Ref
Preventive Care	1.122	0.827***	0.865**
Preventive Care Status (one year lag)			
No Preventive Care (one year lag)	Ref	Ref	Ref
Preventive Care (one year lag)	0.838	0.618***	0.638***
Age (in years)		1.042***	1.043***
Sex			
Male		Ref	Ref
Female		0.698***	0.687***
HMO Plan Status			
Non-HMO		Ref	Ref
HMO		1.213**	1.155*
Insurance Plan Type			
Individual Plan		Ref	Ref
Private Employer or Group Plan		1.815***	1.735**
Public Employer Plan		1.748**	1.64**
Comprehensive Standard Health Benefit Plan		1.675**	1.639*
Other Plan Type		2.61***	2.463***
Chronic Conditions			
No Chronic Conditions		Ref	Ref
One Chronic Condition		1.728***	1.632***
Multiple Chronic Conditions		1.707***	1.667***
Percent Population in Poverty (Zip Code)			1.001
Percent Unemployed (Zip Code)			1.028
Percent Uninsured (Zip Code)			0.993
Percent Hispanic (Zip Code)			0.999
Percent White (Zip Code)			0.992***
Percent High School (Zip Code)			0.975***
Percent Not US Citizen (Zip Code)			1.0004
Percent Don't Speak English at Home (Zip Code)			0.99**
Primary Care Physicians per 1,000 Population (County)			1.028
Specialists per 1,000 Population (County)			0.915
Hospitals per 1,000 Population (County)			25.523
Federally Qualified Health Centers per 1,000 Population (County)			2.298

Constant		0.002***	0.03***

Notes:

1) Data are from the Maryland Medical Care Database (2012-2014), American Community Survey (2013), and the Area Health Resources File (2012)
2) *p<0.05, **p<0.01, ***p<0.001

Table 4.4: Panel Ordered Logistic Regression Results (Odds Ratios) Examining the Effect of Primary Care on the odds of Having any Hospitalization and the Odds of Having an Ambulatory Care Sensitive Condition Hospitalization in Maryland in 2012-2014

Variable	Model 3a	Model 3b	Model 3c
Preventive Care Status			
No Preventive Care	Ref	Ref	Ref
Preventive Care	0.739***	0.77***	0.769***
Age (in years)		0.9995	0.9997
Sex			
Male		Ref	Ref
Female		1.444***	1.442***
HMO Plan Status			
Non-HMO		Ref	Ref
HMO		0.834***	0.812***
Insurance Plan Type			
Individual Plan		Ref	Ref
Private Employer or Group Plan		1.307***	1.324***
Public Employer Plan		1.481***	1.468***
Comprehensive Standard Health Benefit Plan		1.127***	1.152***
Other Plan Type		2.468***	2.498***
Chronic Conditions			
No Chronic Conditions		Ref	Ref
One Chronic Condition		2.385***	2.398***
Multiple Chronic Conditions		0.095***	0.096***
Percent Population in Poverty (Zip Code)			0.988***
Percent Unemployed (Zip Code)			0.992*
Percent Uninsured (Zip Code)			0.996**
Percent Hispanic (Zip Code)			0.992***
Percent White (Zip Code)			0.998***
Percent High School (Zip Code)			0.981***
Percent Not US Citizen (Zip Code)			1.001***
Percent Don't Speak English at Home (Zip Code)			1.00005
Primary Care Physicians per 1,000 Population (County)			0.909***
Specialists per 1,000 Population (County)			1.07***
Hospitals per 1,000 Population (County)			0.001***
Federally Qualified Health Centers per 1,000 Population (County)			0.272***

Notes:

1) Data are from the Maryland Medical Care Database (2012-2014), American Community Survey (2013), and the Area Health Resources File (2012)
2) *p<0.05, **p<0.01, ***p<0.001

Table 4.5: Panel Ordered Logistic Regression Results (Odds Ratios) Examining the Effect of Primary Care on the odds of Having any Hospitalization and the Odds of Having an Ambulatory Care Sensitive Condition Hospitalization in Maryland in 2012-2014, Including a One Year Lag Effect in Primary Care

Variable	Model 4a	Model 4b	Model 4c
Preventive Care Status			
No Preventive Care	Ref	Ref	Ref
Preventive Care	0.621***	0.667***	0.672***
Preventive Care Status (one year lag)			
No Preventive Care (one year lag)	Ref	Ref	Ref
Preventive Care (one year lag)	0.818***	0.903***	0.911***
Age (in years)		0.999***	0.999***
Sex			
Male		Ref	Ref
Female		1.604***	1.598***
HMO Plan Status			
Non-HMO		Ref	Ref
HMO		1.099***	1.073***
Insurance Plan Type			
Individual Plan		Ref	Ref
Private Employer or Group Plan		1.167***	1.173***
Public Employer Plan		1.371***	1.352***
Comprehensive Standard Health Benefit Plan		1.076	1.082*
Other Plan Type		1.015	1.009
Chronic Conditions			
No Chronic Conditions		Ref	Ref
One Chronic Condition		2.889***	2.864***
Multiple Chronic Conditions		0.18***	0.181***
Percent Population in Poverty (Zip Code)			0.992***
Percent Unemployed (Zip Code)			1.007
Percent Uninsured (Zip Code)			1.005**
Percent Hispanic (Zip Code)			0.998*
Percent White (Zip Code)			0.9995
Percent High School (Zip Code)			0.988***
Percent Not US Citizen (Zip Code)			1.001*
Percent Don't Speak English at Home (Zip Code)			0.996***
Primary Care Physicians per 1,000 Population (County)			0.879***
Specialists per 1,000 Population (County)			1.072***
Hospitals per 1,000 Population (County)			0.008***
Federally Qualified Health Centers per 1,000 Population (County)			0.293**

Notes:

1) Data are from the Maryland Medical Care Database (2012-2014), American Community Survey (2013), and the Area Health Resources File (2012)
2) *p<0.05, **p<0.01, ***p<0.001

Chapter 5: Conclusions

SUMMARY

This dissertation examined the relationship between the ACA and disparities in utilization of preventive services, as well as the relationship between primary care and ACSC hospitalizations, and how both individual and contextual factors play into these relationships, especially for vulnerable populations. In this final chapter, I summarize the major findings of my studies, examine the strengths and weaknesses of my research, and finally I discuss the policy implications of my research and direction for future research.

FINDINGS

Major Findings of Study 1 (Chapter 2)

In my first study (Chapter 2), I used national-level data from the National Health Interview Survey (NHIS) from 2011-2015 to examine 1) whether there are disparities in utilization of preventive services among vulnerable populations, 2) whether the full expansion of the ACA in 2014 was associated with a change in utilization patterns of preventive services among vulnerable populations, and 3) whether having an insurance plan purchased through the exchanges set up by the ACA was associated with utilization of preventive services among the privately insured after the full implementation of the ACA in 2014.

I found that, overall, for the years 2011-2015, higher income and education levels were associated with an increase in the odds of utilization of preventive services, with the exception of being low-income being associated with a decrease in

the odds of utilization of some services, compared to poor individuals. This reinforces the trend that those in the coverage gap, who make too much money to qualify for Medicaid and not enough to afford their own insurance policies and/or work for a company the provides employer sponsored coverage, continue to struggle in terms of access to and utilization of healthcare. I also found that, similar to previous studies, being a racial and ethnic minority was associated with an increase in the odds of utilizing most preventive services, but not all. Finally, I found that, overall, the full implementation of the ACA in 2014 was associated with an increase in the odds of utilization of some preventive services, and a decrease in the odds of utilization of other preventive services.

However, I also found that the full implementation of the ACA in 2014 did not result in many differences in disparities in the odds of utilization of preventive services among vulnerable populations. This is interesting, since the ACA aims to reduce health disparities among vulnerable populations. I also found that, among the privately insured after the full implementation of the ACA (in 2014 and 2015), having an insurance plan purchased through the exchanges was associated with a significant decrease in the odds of utilization of all preventive services, except blood sugar check. These results could be explained by low awareness levels of the expansions of coverage available because of the ACA, both in the general population and among vulnerable populations. Additionally, many newly insured individuals may not have knowledge of how to navigate the healthcare system to get the care they need, even with increased coverage.

Major Findings of Study 2 (Chapter 3)

In my second study (Chapter 3), I used state-level Medical Expenditure Panel Survey (MEPS) data (2009-2014) and Kaiser Family Foundation Medicaid policy data (2010 and 2013) to evaluate the effect of both Medicaid expansion and state Medicaid policies on the utilization of preventive services among Medicaid beneficiaries, including vulnerable populations. I hypothesized that 1) Medicaid coverage of preventive services would be associate with an increase in the odds of utilization, 2) Medicaid beneficiary copay for preventive services would be associated with a decrease in the odds of utilization of preventive services, 3) Medicaid expansion in 2014 under the ACA would increase the odds of utilization of preventive services for those in expansion states, and 4) Medicaid expansion would reduce disparities in the odds of utilization of preventive services among vulnerable populations.

In terms of state Medicaid policy in 2010 and 2013, I did not see any significant associations between state Medicaid coverage of and copay for preventive services and the odds of utilizing any preventive services, except for flu shot. Results showed that Medicaid expansion did not have a significant effect on the utilization of any of the preventive services examined. Additionally, I did not see many effects of the Medicaid expansion on disparities in the odds of utilization of preventive service among vulnerable populations. These results could indicate, again, that there may be a deficit in the knowledge of the increased access to coverage under the ACA, especially among vulnerable populations, and/or a deficit in knowledge of how to navigate the healthcare system, particularly among the newly insured.

Major Findings of Study 3 (Chapter 4)

In my third study (Chapter 4) I used the Maryland Medical Care Database (2012-2014), which includes information on all healthcare utilization for the commercially insured in the state of Maryland, as well as zip code-level population characteristics from the American Community Survey (2013), and county-level characteristics from the Area Health Resources File (2012) to evaluate the effect of primary care utilization on 1) the odds of having an ACSC hospitalization among those with any hospitalizations and 2) the odds of having any hospitalization and the odds of having an ACSC hospitalization among the overall population. I examined adjusted and unadjusted models, both with and without a one year lag effect of primary care.

I found that, in all adjusted models, primary care was significantly associated with a decrease in the odds of an ACSC hospitalization among those with any hospitalizations, as well as a decrease in the odds of having any hospitalizations and the odds of having an ACSC hospitalization among the entire population. When controlling for a one year lag effect in primary care, the decrease in the odds of having any hospitalization and the odds of having an ACSC hospitalization was even more significant, which indicates the importance of continuity of primary care in decreasing the odds of any hospitalizations and the odds of ACSC hospitalizations. I also found that several area characteristics were associated with the odds of having any hospitalization and the odds of having an ACSC hospitalization, which indicates that efforts to increase access to primary care among certain areas could significantly reduce hospitalizations overall and ACSC hospitalizations specifically.

RESEARCH LIMITATIONS AND STRENGTHS

The major limitation of my first two studies is that they use survey data. Although both National Health Interview Survey and Medical Expenditure Panel Survey use complex sampling methods and include probability weights that can be used to generate population statistics, they still suffer from the inevitable problem of bias that comes from self-reported survey data. A limitation in my third study is that the availability of data does not allow any analysis examining the effect of policy. All three studies also have pros and cons in the way I chose to measure my variables, discussed in more detail in each chapter.

Although my research does have limitations, it also has many strengths. By using new and robust data and analyses, my dissertation fills in many gaps in the existing literature surrounding the effects of the ACA on utilization of primary and preventive care and the importance of ongoing primary and preventive care, especially among vulnerable populations. For my first two studies, I used logistic regression models with interaction terms, as well as difference-in-differences and difference-in-difference-in-differences linear probability models to examine, not just the effect of the ACA on preventive service utilization overall or access to care for vulnerable populations, but rather the effect of the ACA on preventive service utilization among vulnerable populations specifically. For my third study, the main strength is that it used longitudinal panel data, which allowed me to control for many things that previous studies analyzing the relationship between primary care and preventable hospitalizations were not able to control for. Mainly, I was able to control

for individual characteristics over time, as well as a lag in primary care, instead of primary care only during the same year of data.

The results of my studies also point to several important policy implications that could help improve utilization of preventive services and reduce the burden of chronic conditions, especially among vulnerable populations. First, most studies examining the effect of the ACA to date look at only the effect of overall utilization of primary care/preventive services or overall access to healthcare for vulnerable populations. To my knowledge, no studies to date examine the effect of the ACA on access to preventive services among vulnerable populations specifically. Second, no studies to my knowledge to date examine the effect of specific Medicaid policy on coverage of and copay for preventive services on utilization of said preventive services. Next, although there is a study examining the effect of Medicaid expansion on utilization of preventive services, the study has several limitations that I attempt to control for in my analyses, including examining effects among vulnerable populations specifically. Finally, although there is an abundance of literature examining the relationship among primary care and preventive hospitalizations, few studies use all payer data, and to my knowledge, no studies to date were able to control for a lag in utilization of primary care using panel data.

POLICY IMPLICATIONS AND FUTURE RESEARCH

My studies indicate that, although the ACA increased access to care for millions of Americans, this increased access may not be enough to increase utilization rates of preventive services among the general population, and specifically among vulnerable populations. Research shows that many Americans, especially vulnerable

populations, are not aware of the increases in coverage that were newly available to them under the ACA. Additionally, many newly insured individuals may not have received the care that they needed due to a lack of understanding of how to navigate the healthcare system. Finally, there may be a deficit in knowledge of what preventive services are required of whom and when, by both patients and providers.

All of these findings put together indicate that focus should be put on education, not just access to care. People need to know what options are available to them, especially regarding increased access under the ACA and to vulnerable populations. Additionally, it would be helpful to educate people about how to use the healthcare system once they do acquire coverage. For example, showing them how to find a primary care physician in their network. Finally, educating the public, especially those newly insured and vulnerable populations, on what preventive services are recommended when and for whom could significantly increase utilization, especially among vulnerable populations.

Results of papers one and two point to some important access issues concerning flu shot. In paper one (Chapter 2), my overall results showed that those with low-incomes were less likely to utilize flu shots than those who were poor. I also found that the ACA was associated with an increase in access to flu shots for higher education groups, but not income groups. Lastly, I found that, among the privately insured, those with plans purchased through the exchanges set up by the ACA were less likely to receive flu shot. In paper two (Chapter 3), I found that Medicaid coverage of flu shot significantly increased the odds of receiving flu shot. I also found

that Medicaid expansion did not result in an increase in flu shot utilization overall, but it did increase utilization among near poor individuals, Asians, and Latinos.

These results indicate that flu shot utilization is an issue for those in the coverage gap, and the increased insurance coverage of the ACA may not be enough to address this issue. Results also indicate that copay plays a significant role in utilization of flu shots. Flu shots are widely available in the community, but not all insurance types cover the flu shot. Without insurance coverage, an individual will pay about $30 out of pocket for a flu shot. That cost can be a significant barrier for vulnerable populations. Additionally, insurance plans often only cover the flu shot if you get it from your physician or certain predetermined locations (DHHS, 2014c), not necessarily at your local pharmacy or drug store. This confusion itself could also be a barrier to access.

It is important to increase utilization of flu shot, since the flu has such widespread reach and poses a significant burden in the US. In the 2015-2016 flu season, it is estimated that the flu was associated with 25 million cases of illness, 11 million medical visits, and 310,000 hospitalizations (Rolfes et al., 2016). Furthermore, it is estimated that 5.1 million cases of illness, 2.5 million medical visits, and 71,000 hospital visits were prevented in the 2015-2016 flu season thanks to the flu shot (Rolfes et al., 2016). However, only about 30%-70% percent of people received their flu shot, depending on age group (Rolfes et al., 2016), which means that many more cases of illness, medical visits, and hospitalizations could be prevented with higher utilization rates. If insurance plans were more flexible in their coverage of flu shots, pharmacies were more flexible in accepting insurance for flu

shot, and more effort was made to stress the burden the flu shot can prevent, utilization of flu shot could increase, especially for vulnerable populations.

Finally, my third paper shows that continuity of primary care is important in preventing any hospitalization and potentially preventable hospitalizations among the entire population, as well as reducing the odds of having a potentially preventable hospitalization among those that were hospitalized. This again indicates the importance of, not just utilization of primary care and preventive services, but also the importance of continuity of care. Therefore, encouraging education on the importance of following up with a primary care physician is an important policy implication that could have significant effects on utilization of care and preventing chronic disease related illnesses.

The results of my studies further emphasize the relevance of the Andersen Behavioral Model of Health Services Use when understanding what factors play into the utilization of preventive services and potentially preventable hospitalizations. The main independent variables in my first two studies were enabling factors, specifically insurance coverage. I found that insurance coverage alone is not enough to ensure utilization of preventive services. I therefore attempt to control for other predisposing (sex, race, ethnicity, and education), enabling (income, employment, type of insurance, copay), and need (chronic conditions, self-reported health status) factors in my models to help me better understand the relationship between predisposing, enabling, and need factors and utilization of healthcare. In my third study, again my focus is on enabling factors (utilization of primary care). I found that utilization of primary care alone is not enough to explain why potentially preventable

hospitalizations occur. I then control for predisposing (age and sex of the individual, demographic and social characteristics of the community), enabling (type of insurance coverage of the individual, income, employment and insurance coverage in the community), and need (chronic conditions of the individual, healthcare resources in the community) factors to help better understand what factors are associated with potentially preventable hospitalizations. My dissertation study findings verify that the factors associated with health services use are multifaceted and complex and point to a few key policy implications that could better explain the relationship between predisposing, enabling, and need factors and the utilization of preventive services and potentially preventable hospitalizations.

CONCLUSION

The ACA was the most significant piece of healthcare legislature since the establishment of Medicare and Medicaid in the 1960s. It resulted in a tremendous increase in insurance coverage and access to care among Americans. However, no piece of legislature is perfect, and research to date, including my own research, indicates that the ACA's many achievements may not be enough to improve healthcare outcomes and reduce healthcare expenditures alone. The mixed findings on utilization of healthcare post-ACA could be due to lack of education or awareness, or simply due to not enough time having passed since the full implantation of the ACA in 2014 to observe any true effects. This is especially important as the United States moves forward with a new administration that plans to repeal the ACA, which could result in millions of Americans losing coverage. The Republican party has voiced strong opposition to the ACA from the very beginning and vowed to repeal

and replace the ACA once their party regained power in the new administration, beginning in 2016.

The new administration has introduced many bills aiming to repeal and/or replace the ACA, including one entitled (seemingly without irony), "World's Greatest Healthcare Plan of 2017" (H.R. 1275, 2017). The problem with most of the replacement plans for the ACA is that they keep the popular parts of the ACA, such as the pre-existing conditions clause, while getting rid of the unpopular parts, such as the individual mandate. At face value, this seems like a good idea, but experts agree that the ACA works best as a cohesive plan, with all parts working together to achieve the end goal of increased access, improved outcomes, and reduced expenditures. The Congressional Budget Office estimates that the most recent plan to replace the ACA, entitled, "The American Healthcare Plan," would indeed save a lot of money (Congressional Budget Office [CBO], 2017). However, it would also result in up to 24 million Americans losing their health insurance and dramatic increases in premiums for many older Americans (CBO, 2017). Although the research on the effect of the ACA on utilization of care is mixed, one thing is certain: millions of Americans losing their health insurance coverage would almost definitely result in a decrease in utilization of care, and an increase in chronic disease related healthcare expenditures. As America moves forward under a new administration, it is important that we fully understand the effects of the ACA before we repeal and replace it with something that could undo all of the progress that the ACA has already made.

APPENDICES

Appendix 3.1: State Medicaid Expansion Status as of January 1, 2014

State	Medicaid Expansion Status as of January 1, 2014
Alabama	Not Adopting the Medicaid Expansion
Alaska	Not Adopting the Medicaid Expansion
Arizona	Adopted the Medicaid Expansion
Arkansas	Adopted the Medicaid Expansion
California	Adopted the Medicaid Expansion
Colorado	Adopted the Medicaid Expansion
Connecticut	Adopted the Medicaid Expansion
District of Columbia	Adopted the Medicaid Expansion
Delaware	Adopted the Medicaid Expansion
Florida	Not Adopting the Medicaid Expansion
Georgia	Not Adopting the Medicaid Expansion
Hawaii	Adopted the Medicaid Expansion
Idaho	Not Adopting the Medicaid Expansion
Illinois	Adopted the Medicaid Expansion
Indiana	Not Adopting the Medicaid Expansion
Iowa	Adopted the Medicaid Expansion
Kansas	Not Adopting the Medicaid Expansion
Kentucky	Adopted the Medicaid Expansion
Louisiana	Not Adopting the Medicaid Expansion
Maine	Not Adopting the Medicaid Expansion
Maryland	Adopted the Medicaid Expansion
Massachusetts	Adopted the Medicaid Expansion
Michigan	Not Adopting the Medicaid Expansion
Minnesota	Adopted the Medicaid Expansion
Mississippi	Not Adopting the Medicaid Expansion
Missouri	Not Adopting the Medicaid Expansion
Montana	Not Adopting the Medicaid Expansion
Nebraska	Not Adopting the Medicaid Expansion
Nevada	Adopted the Medicaid Expansion
New Hampshire	Not Adopting the Medicaid Expansion
New Jersey	Adopted the Medicaid Expansion
New Mexico	Adopted the Medicaid Expansion
New York	Adopted the Medicaid Expansion
North Carolina	Not Adopting the Medicaid Expansion
North Dakota	Adopted the Medicaid Expansion
Ohio	Adopted the Medicaid Expansion
Oklahoma	Not Adopting the Medicaid Expansion
Oregon	Adopted the Medicaid Expansion

State	Medicaid Expansion Status as of January 1, 2014
Pennsylvania	Not Adopting the Medicaid Expansion
Rhode Island	Adopted the Medicaid Expansion
South Carolina	Not Adopting the Medicaid Expansion
South Dakota	Not Adopting the Medicaid Expansion
Tennessee	Not Adopting the Medicaid Expansion
Texas	Not Adopting the Medicaid Expansion
Utah	Not Adopting the Medicaid Expansion
Vermont	Adopted the Medicaid Expansion
Virginia	Not Adopting the Medicaid Expansion
Washington	Adopted the Medicaid Expansion
West Virginia	Adopted the Medicaid Expansion
Wyoming	Not Adopting the Medicaid Expansion
Wisconsin	Not Adopting the Medicaid Expansion

REFERENCES

Agency for Healthcare Research and Quality. (2002). *Guide to Prevention Quality Indicators, 2001* (AHRQ Publication No. 02-R0203). Rockville, MD.

Agency for Healthcare Research and Quality. (2009). *Medical Expenditure Panel Survey (MEPS): Survey Background.* Retrieved from: http://meps.ahrq.gov/mepsweb/about_meps/survey_back.jsp

Andersen, R. M., & Davidson, P. L. (2001). Improving access to care in America: individual and contextual indicators. In R. M. Andersen, T.H. Rice, & E. F. Kominski (Eds.), *Changing the U.S. health care system: key issues in health services, policy, and management* (3-30). San Francisco, CA: Jossey-Bass.

Bocour, A., & Tria, M. (2016). Preventable hospitalization rates and neighborhood poverty among New York City residents, 2008-2013. *J Urban Health, 93*(6), 974-983. doi:10.1007/s11524-016-0090-5

Caminal, J., Starfield, B., Sanchez, E., Casanova, C., & Morales, M. (2004). The role of primary care in preventing ambulatory care sensitive conditions. *Eur J Public Health, 14*(3), 246-251.

Centers for Disease Control & Prevention. (2013). *Preventive Care. Gateway to Health Communication and Social Marketing Practice.* Retrieved from: http://www.cdc.gov/healthcommunication/ToolsTemplates/EntertainmentEd/Tips/PreventiveHealth.html

Centers for Disease Control & Prevention. (2014). *Deaths and Mortality. National Center for Health Statistics.* Retrieved from: http://www.cdc.gov/nchs/fastats/deaths.htm

Centers for Disease Control & Prevention. (2016). *About the National Health Interview Survey.* Retrieved from: https://www.cdc.gov/nchs/nhis/about_nhis.htm

Centers for Medicare & Medicaid Services. (2014). *Cost sharing and out of pocket costs.* Retrieved from: https://www.medicaid.gov/medicaid/cost-sharing/out-of-pocket-costs/index.html

Centers for Medicare & Medicaid Services. (2016a). *National Health Expenditure Fact Sheet.* Retrieved from: https://www.cms.gov/research-statistics-data-and-systems/statistics-trends-and-reports/nationalhealthexpenddata/nhe-fact-sheet.html

Centers for Medicare & Medicaid Services. (2016b). *January – March 2016 Medicaid MBES Enrollment Report.* Retrieved from: https://www.medicaid.gov/medicaid/program-information/medicaid-and-chip-enrollment-data/enrollment-mbes/index.html

Centers for Medicare & Medicaid Services. (2017). *December, 2016 Medicaid and Chip Enrollment Highlights. Fact Sheet.* Retrieved from: https://www.medicaid.gov/medicaid/program-information/medicaid-and-chip-enrollment-data/report-highlights/index.html

Chen, J., Vargas-Bustamante, A., Mortensen, K., & Ortega, A.N. (2016). Racial and ethnic disparities in health care access and utilization under the Affordable Care Act. *Med Care, 54*(2): 140-146. doi: 10.1097/MLR.0000000000000467

Cheung, P. T., Wiler, J. L., Lowe, R. A., & Ginde, A. A. (2012). National study of barriers to timely primary care and emergency department utilization among Medicaid beneficiaries. *Ann Emerg Med* (Vol. 60, pp. 4-10 e12). United States: Inc.

Clark, C. R., Ommerborn, M. J., Coull, B. A., Pham, D. Q., & Haas, J. (2013). State Medicaid eligibility and care delayed because of cost. *N Engl J Med, 368*(13), 1263-1265. doi:10.1056/NEJMc1214874

Congresssional Budget Office. (2017). *Congressional Budget Office Cost Estimate: American Health Care Act - Budget Reconcilliation Recommendations of the House Committees on Ways and Means and Energey and Commerce, March 9, 2017.* Retrieved from: https://www.cbo.gov/system/files/115th-congress-2017-2018/costestimate/americanhealthcareact.pdf

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

Dave, K. & Kaestner, R. (2009). Health insurance and ex ante moral hazard: evidence from Medicare. *Int J Health Care Finance Econ, 9*(4): 367-390.

Department of Health and Human Services. (2014a). *Profile: Asian Americans. Office of Minority Health Disparities.* Retrieved from: http://minorityhealth.hhs.gov/omh/browse.aspx?lvl=3&lvlid=63

Department of Health and Human Services. (2014b). *Increased coverage of preventive services with zero cost sharing under the Affordable Care Act. Office of the Assistant Secretary for Planning and Evaluation. ASPE Data Point.* Retrieved from: https://aspe.hhs.gov/sites/default/files/pdf/76901/ib_PreventiveServices.pdf

Department of Health and Human Services. (2014c). *Will the Affordable Care Act cover my flu shot?* Retrieved from: https://www.hhs.gov/answers/affordable-care-act/will-the-aca-cover-my-flu-shot/index.html

Department of Health and Human Services. (2015a). *Profile: Hispanic/Latino Americans.* Retrieved from: http://minorityhealth.hhs.gov/omh/browse.aspx?lvl=3&lvlid=64

Department of Health and Human Services. (2015b). *The Affordable Care Act is Improving Access to Preventive Services for Millions of Americans. Office of the Assistant Secretary for Planning and Evaluation. ASPE Data Point.* Retrieved from: https://aspe.hhs.gov/pdf-report/affordable-care-act-improving-access-preventive-services-millions-americans

Department of Health and Human Services. (2016a). *Profile: Black/African Americans. Office of Minority Health.* Retrieved from: http://minorityhealth.hhs.gov/omh/browse.aspx?lvl=3&lvlid=61

Department of Health and Human Services. (2016b). *20 million people have gained health insurance coverage because of the Affordable Care Act, new estimates show.* Retrieved from:

http://www.hhs.gov/about/news/2016/03/03/20-million-people-have-gained-health-insurance-coverage-because-affordable-care-act-new-estimates
Dickman, S. L., Himmelstein, D. U., McCormick, D., & Woolhandler, S. (2015). Health and financial consequences of 24 states' decision to opt out of Medicaid expansion. *Int J Health Serv, 45*(1), 133-142. doi:10.2190/HS.45.1.j
Djojonegoro, B. M., Aday, L. A., Williams, A. F., & Ford, C. E. (2000). Area income as a predictor of preventable hospitalizations in the Harris County Hospital District, Houston. *Tex Med, 96*(1), 58-62.
Finkelstein A, Baicker K, Wright B, Allen H, Bernstein M, Gruber J, Newhouse J, Schneider E, Taubman S, Zaslavsky A. (2012a). *The Oregon Health Insurance Experiment: About the Study. National Bureau of Economics Research.* Retrieved from: http://www.nber.org/oregon/
Finkelstein, A., Taubman, S., Wright, B., Bernstein, M., Gruber, J., Newhouse, J. P., Baicker, K. (2012b). The Oregon health insurance experiment: Evidence from the first year. *Q J Econ, 127*(3), 1057-1106.
Fox, J. B., & Shaw, F. E. (2014). Relationship of income and health care coverage to receipt of recommended clinical preventive services by adults - United States, 2011-2012. *MMWR Morb Mortal Wkly Rep, 63*(31), 666-670.
Fox, J. B., & Shaw, F. E. (2015). Receipt of selected clinical preventive services by adults - United States, 2011-2012. *MMWR Morb Mortal Wkly Rep, 64*(27), 738-742.
Frakt, A. B., & Carroll, A. E. (2013). Sound policy trumps politics: states should expand Medicaid. *J Health Polit Policy Law, 38*(1), 165-178. doi:10.1215/03616878-1898839
Frean, M., Gruber, J., & Sommers, B. D. (2017). Premium subsidies, the mandate, and Medicaid expansion: Coverage effects of the Affordable Care Act. *J Health Econ, 53*, 72-86. doi:10.1016/j.jhealeco.2017.02.004
Gai, Y., & Feng, L. (2013). Factors associated with first-time use of preventive services in the United States. *Am J Health Behav, 37*(2), 257-268. doi:10.5993/ajhb.37.2.13
Garcia Mosqueira, A., Hua, L. M., & Sommers, B. D. (2015). Racial differences in awareness of the Affordable Care Act and application assistance among low-income adults in three southern states. *Inquiry, 52*. doi:10.1177/0046958015609607
Gates A, Ranji U, Snyder L. (2014). *Coverage of Preventive Services for Adults in Medicaid. The Henry J. Kaiser Family Foundation.* Retrieved from: http://kff.org/medicaid/issue-brief/coverage-of-preventive-services-for-adults-in-medicaid/
Gerteis, J., Izrael, D., Deitz, D., LeRoy, L., Ricciardi, R., Miller, T., Basu, J. (2014). *Multiple Chronic Conditions Chartbook* (AHRQ Publications No, Q14-0038). Rockville, MD: Agency for Healthcare Research and Quality. Retrieved from: https://www.ahrq.gov/sites/default/files/wysiwyg/professionals/prevention-chronic-care/decision/mcc/mccchartbook.pdf
Geyman, J.P. (2007). Moral hazard and consumer-driven health care: a fundamentally flawed concept. *Int J Health Serv, 37*(2), 333-351.

Gibson, O. R., Segal, L., & McDermott, R. A. (2013). A systematic review of evidence on the association between hospitalisation for chronic disease related ambulatory care sensitive conditions and primary health care resourcing. *BMC Health Serv Res 13*, 336.

Government Accountability Office. (2009). *Report to the Chairman, Committee on Finance, United States Senate. Medicaid Preventive Services: Concerted Efforts Needed to Ensure Beneficiaries Receive Services* (GAO Report No: GAO-09-578). Retrieved from: http://www.gao.gov/assets/300/293989.pdf

Grohskopf, L. A., Sokolow, L. Z., Broder, K. R., Olsen, S. J., Karron, R. A., Jernigan, D. B., & Bresee, J. S. (2016). Prevention and control of seasonal influenza with vaccines. *MMWR Recomm Rep, 65*(5), 1-54. doi:10.15585/mmwr.rr6505a1

Grol, R. (2001). Successes and failures in the implementation of evidence-based guidelines for clinical practice. *Med Care, 39*(8 Suppl 2), II46-II54.

Hamel, L., Norton, M., Levitt, L., Claxton, G., Cox, C., Pollitz, K., & Brodie, M. (2014). *Survey of Non-Group Health Insurance Enrolless.* Kaiser Family Foundation. Retrieved from: http://kff.org/health-reform/report/survey-of-non-group-health-insurance-enrollees/

Han, X., Nguyen, B. T., Drope, J., & Jemal, A. (2015). Health-related outcomes among the poor: Medicaid expansion vs. non-expansion states. *PLoS One, 10*(12), e0144429. doi:10.1371/journal.pone.0144429

Han, X., Robin Yabroff, K., Guy, G. P., Jr., Zheng, Z., & Jemal, A. (2015). Has recommended preventive service use increased after elimination of cost-sharing as part of the Affordable Care Act in the United States? *Prev Med, 78*, 85-91. doi:10.1016/j.ypmed.2015.07.012

Hartman, M., Martin, A. B., Lassman, D., & Catlin, A. (2015). National health spending in 2013: growth slows, remains in step with the overall economy. *Health Aff (Millwood), 34*(1), 150-160. doi:10.1377/hlthaff.2014.1107

Holden, C. D., Chen, J., & Dagher, R. K. (2015). Preventive care utilization among the uninsured by race/ethnicity and income. *Am J Prev Med, 48*(1), 13-21. doi:10.1016/j.amepre.2014.08.029

Johnson, P. J., Ghildayal, N., Ward, A. C., Westgard, B. C., Boland, L. L., & Hokanson, J. S. (2012). Disparities in potentially avoidable emergency department (ED) care: ED visits for ambulatory care sensitive conditions. *Med Care, 50*(12), 1020-1028. doi:10.1097/MLR.0b013e318270bad4

Kaestner, R., Joyce, T., & Racine, A. (2001). Medicaid eligibility and the incidence of ambulatory care sensitive hospitalizations for children. *Soc Sci Med, 52*, 305-313.

Kaiser Commission on Medicaid and the Uninsured. (2012a). *The Role of Medicaid for Adults with Chronic Illnesses.* Retrieved from: https://kaiserfamilyfoundation.files.wordpress.com/2013/01/8383.pdf

Kaiser Commission on Medicaid and the Uninsured. (2012b). *Coverage of Preventive Services for Adults in Medicaid. Kaiser Family Foundation.* Retrieved from: http://kaiserfamilyfoundation.files.wordpress.com/2013/01/8359.pdf

Kaiser Family Foundation. (2017a). *Status of State Action on the Medicaid Expansion Decision.* Retrieved from: http://kff.org/health-reform/state-indicator/state-activity-around-expanding-medicaid-under-the-affordable-care-act/?currentTimeframe=0&sortModel=%7B%22colId%22:%22Location%22,%22sort%22:%22asc%22%7D

Kaiser Family Foundation. (2017b). *Medicaid Income Eligibility Limits for Adults as Percent of the Federal Poveryt Level.* Retrieved from: http://kff.org/health-reform/state-indicator/medicaid-income-eligibility-limits-for-adults-as-a-percent-of-the-federal-poverty-level/?currentTimeframe=0&sortModel=%7B%22colId%22:%22Parents%20(in%20a%20family%20of%20three)%22,%22sort%22:%22asc%22%7D

Kemp, K., Neuman, P., Howard, D., Miller, G., O'Grady, M., Baker, C. (2012). *Research Insights: The Economics of Prevention.* AcademyHealth. Retrieved from: http://www.academyhealth.org/files/FileDownloads/RI_Econ_Prevention.pdf

Kenney, G. M., Lynch, V., Haley, J., & Huntress, M. (2012). Variation in Medicaid eligibility and participation among adults: implications for the Affordable Care Act. *Inquiry, 49*(3), 231-253.

Laditka, J. N., Laditka, S. B., & Mastanduno, M. P. (2003). Hospital utilization for ambulatory care sensitive conditions: health outcome disparities associated with race and ethnicity. *Soc Sci Med, 57,* 1429-1441.

Langellier, B. A., Guernsey de Zapien, J., Rosales, C., Ingram, M., & Carvajal, S. C. (2014). State Medicaid expansion, community interventions, and health care disparities in a United States-Mexico border community. *Am J Public Health, 104*(8), e94-e100. doi:10.2105/ajph.2014.302013

Lantz, P. M., Evans, W. D., Mead, H., Alvarez, C., Stewart, L. (2016). Knowledge of and attitudes toward evidence-based guidelines for and against clinical preventive services: Results from a national survey. *Milbank Q., 94*(1), 51-76.

Long S, Stockley K, Grimm E, & Coyer C. (2012). *National Findings on Access to Health Care and Service Use for Non-elderly Adults Enrolled in Medicaid. MACPAC Contractor Report No. 2.* The Urban Institute. Retrieved from: https://docs.google.com/viewer?a=v&pid=sites&srcid=bWFjcGFjLmdvdnxtYWNwYWN8Z3g6ZGI1YmY1ZTZmYzA0NmQx)

Maciosek, M. V., Coffield, A. B., Flottemesch, T. J., Edwards, N. M., & Solberg, L. I. (2010). Greater use of preventive services in U.S. health care could save lives at little or no cost. *Health Aff (Millwood), 29*(9), 1656-1660. doi:10.1377/hlthaff.2008.0701

Martinez, M. E., & Ward, B. W. (2016). Health Care access and utilization among adults aged 18-64, by poverty level: United States, 2013-2015. *NCHS Data Brief* (262), 1-8.

Mehta, S. J., Polsky, D., Zhu, J., Lewis, J. D., Kolstad, J. T., Loewenstein, G., & Volpp, K. G. (2015). ACA-mandated elimination of cost sharing for preventive screening has had limited early impact. *Am J Manag Care, 21*(7), 511-517.

Meissner, H. I., Klabunde, C. N., Breen, N., & Zapka, J. M. (2012). Breast and colorectal cancer screening: U.S. primary care physicians' reports of barriers. *Am J Prev Med, 43*(6), 584-589. doi:10.1016/j.amepre.2012.08.016

National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research. (1979). *The Belmont Report.* Office of the Secretary; Ethical Principles and Guidelines for the Protection of Human Subjects of Research. The National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research. April 18, 1979. Department of Health, Education, and Welfare. Retrieved from: https://www.hhs.gov/ohrp/regulations-and-policy/belmont-report/

Ndumele, C. D., Mor, V., Allen, S., Burgess, J. F., Jr., & Trivedi, A. N. (2014). Effect of expansions in state Medicaid eligibility on access to care and the use of emergency department services for adult Medicaid enrollees. *JAMA Intern Med, 14*, 920-926.

Nelson, A. (2002). Unequal treatment: Confronting racial and ethnic disparities in health care. *J Natl Med Assoc, 94*(8), 666-668.

Nguyen, O. K., Makam, A. N., & Halm, E. A. (2016). National use of safety-net clinics for primary care among adults with non-Medicaid insurance in the United States. *PLoS One, 11*(3), e0151610. doi:10.1371/journal.pone.0151610

O'Neil, S. S., Lake, T., Merrill, A., Wilson, A., Mann, D. A., & Bartnyska, L. M. (2010). Racial disparities in hospitalizations for ambulatory care-sensitive conditions. *Am J Prev Med, 38*, 381-388.

Oster, A., & Bindman, A. B. (2003). Emergency department visits for ambulatory care sensitive conditions: insights into preventable hospitalizations. *Med Care, 41*(2), 198-207. doi:10.1097/01.mlr.0000045021.70297.9f

Price, C. C., & Eibner, C. (2013). For states that opt out of Medicaid expansion: 3.6 million fewer insured and $8.4 billion less in federal payments. *Health Aff (Millwood), 32*(6), 1030-1036. doi:10.1377/hlthaff.2012.1019

Robert Wood Johnson Foundation. (2007). *Preventive Care: A National Profile on Use, Disparities, and Health Benefits.* Partnership for Prevention. Retrieved from: http://www.rwjf.org/content/dam/farm/reports/reports/2007/rwjf13325

Rolfes, M. A., Foppa, I. M., Garg, S., Flannery, B., Brammer, L., Singleton, J. A., Burns, E., Jernigan, D., Reed, C., Olsen, S. J., & Breese, J. (2016). *Estimated influenza illnesses, medical visits, hospitalizations, and deaths averted by vaccination in the United States.* Centers for Disease Control and Prevention. Retrieved from: https://www.cdc.gov/flu/about/disease/2015-16.htm

Rosano, A., Loha, C. A., Falvo, R., van der Zee, J., Ricciardi, W., Guasticchi, G., & de Belvis, A. G. (2013). The relationship between avoidable hospitalization and accessibility to primary care: a systematic review. *Eur J Public Health, 23*, 356-360.

Sabik, L. M., Tarazi, W. W., & Bradley, C. J. (2015). State Medicaid expansion decisions and disparities in women's cancer screening. *Am J Prev Med, 48*(1), 98-103. doi:10.1016/j.amepre.2014.08.015

Shi, L., Samuels, M. E., Pease, M., Bailey, W. P., & Corley, E. H. (1999). Patient characteristics associated with hospitalizations for ambulatory care sensitive conditions in South Carolina. *South Med J, 92*(10), 989-998.

Simon, K., Soni, A., & Cawley, J. (2017). The impact of health insurance on preventive care and health behaviors: Evidence from the first two years of the ACA Medicaid expansions. *J Policy Anal Manage, 36*(2), 390-417.

Solanki, G., & Schauffler, H. H. (1999). Cost-sharing and the utilization of clinical preventive services. *Am J Prev Med, 17*(2), 127-133.

Smolen, J. R., Thorpe, R. J., Jr., Bowie, J. V., Gaskin, D. J., & LaVeist, T. A. (2014). Health insurance and chronic conditions in low-income urban Whites. *J Urban Health, 91*(4), 637-647. doi:10.1007/s11524-014-9875-6

Sommers, B. D., Baicker, K., & Epstein, A. M. (2012). Mortality and access to care among adults after state Medicaid expansions. *N Engl J Med, 367*(11), 1025-1034. doi:10.1056/NEJMsa1202099

Sommers, B. D., Maylone, B., Nguyen, K. H., Blendon, R. J., & Epstein, A. M. (2015). The impact Of state policies on ACA applications and enrollment among low-income adults in Arkansas, Kentucky, and Texas. *Health Aff (Millwood), 34*(6), 1010-1018. doi:10.1377/hlthaff.2015.0215

Soni, A., Hendryx, M., & Simon, K. (2017). Medicaid expansion under the Affordable Care Act and ensurance coverage in rural and urban areas. *J Rural Health, 33*(2), 217-226. doi:10.1111/jrh.12234

Torio, C. M., & Andrews, R. M. (2006). *Geographic Variation in Potentially Preventable Hospitalizations for Acute and Chronic Conditions, 2005-2011: Statistical Brief #178.* In *Healthcare Cost and Utilization Project (HCUP) Statistical Briefs*. Rockville (MD): Agency for Healthcare Research and Quality (US).

United States Preventive Services Task Force. (2016). *USPSTF A and B Recommendations.* Retrieved from: https://www.uspreventiveservicestaskforce.org/Page/Name/uspstf-a-and-b-recommendations/

Ward, B. W., Schiller, J. S., & Goodman, R. A. (2014). Multiple chronic conditions among US adults: a 2012 update. *Prev Chronic Dis, 11*, E62. doi:10.5888/pcd11.130389

World's Greatest Healthcare Plan, H.R. 1275, 115th Cong. (2017). Retrieved from: https://www.congress.gov/bill/115th-congress/house-bill/1275

Wherry, L. R., & Miller, S. (2016). Early coverage, access, utilization, and health effects associated with the Affordable Care Act Medicaid expansions: A quasi-experimental study. *Ann Intern Med, 164*(12), 795-803. doi:10.7326/m15-2234

Woolf, S. H, Aron, L., Dubay, L., Simon, S. M., Zimmerman, E., Luk, K. X. (2015). *How are Income and Weatlh Linked to Health and Longevity?* Center on Society Health. Urban Institute. Retrieved from: http://www.urban.org/sites/default/files/publication/49116/2000178-How-are-Income-and-Wealth-Linked-to-Health-and-Longevity.pdf

World Health Organization. (2017). *Chronic Diseases and Health Promotion. Part Two: The urgent Need for action. Chapter two: Chronic diseases and poverty.* Retrieved from: http://www.who.int/chp/chronic_disease_report/part2_ch2/en/

Wright, B. J., Conlin, A. K., Allen, H. L., Tsui, J., Carlson, M. J., & Li, H. F. (2016). What does Medicaid expansion mean for cancer screening and prevention? Results from a randomized trial on the impacts of acquiring Medicaid coverage. *Cancer, 122*(5), 791-797. doi:10.1002/cncr.29802

Zimmerman, E., Woolf, S. H., Haley, A. (2015). *Population Health: Behavioral and Social Scienc Insights. Understanding the Relationship Between Education and Health.* Agency for Healthcare Research and Quality. Retrieved from: https://www.ahrq.gov/professionals/education/curriculum-tools/population-health/zimmerman.html