Title Page

**The Effects of the Affordable Care Act on Mental Health in the United States**

by

**Victoria Anne Bacon**

BS, Biology, California State University, Long Beach, 2019

Submitted to the Graduate Faculty of

Human Genetics

Graduate School of Public Health in partial fulfillment

of the requirements for the degree of

Master of Public Health

University of Pittsburgh

2020

Committee Page

UNIVERSITY OF PITTSBURGH

Graduate School of Public Health

This essay is submitted

by

**Victoria Anne Bacon**

on

April 20, 2020

and approved by

**Essay Advisor**

Candace Kammerer, PhD, Associate Professor, Department of Human Genetics, Graduate School of Public Health, University of Pittsburgh

**Essay Reader:**

Elizabeth Van Nostrand, JD, Associate Professor, Director, MPH and JD/MPH Programs, Department of Health Policy and Management

Graduate School of Public Health, University of Pittsburgh

Copyright © by Victoria Anne Bacon

2020

**Abstract**

Candace Kammerer, PhD

**The Effects of the Affordable Care Act on Mental Health in the United States**

Victoria Bacon, MPH

University of Pittsburgh, 2020

**Abstract**

**Background:**

The Affordable Care Act (ACA) was a legislative attempt to improve public health across United States by addressing multiple health-related barriers and concerns. This statute included provisions to reduce the number of uninsured adults through the creation of insurance marketplaces and by expanding Medicaid coverage to people with a low income; however, not all states chose to expand Medicaid. In addition, the impact of the ACA and Medicaid expansion on mental health has not been closely analyzed.

**Methods:**

Using data from the County Health Rankings & Roadmaps program, I investigated the impact of the ACA across states on overall mental health (measured as mean poor mental health days per month, PMHD), proportion of adults without health insurance, and median household income. Data were available for 3 years: 2011, 2015, and 2018. I assessed potential differences in these measures between states with federally-run versus state-run insurance marketplaces, as well as between expansion and non-expansion states.

**Results:**

Compared to states using federally-run marketplaces, states with state-run marketplaces had higher median household incomes ($57,668.04 versus $48,264, p=0.0001) and proportionately fewer adults without health insurance (9.97% versus 14.9%, p=0.0033). Individuals in states with state-run marketplaces reported fewer PMHD than citizens in states using the federally-run marketplace in 2011 (3.24 versus 3.43 days per month, p=0.04) and 2015 (3.26 versus 3.48 days per month, p=0.03), but not for 2018 (3.36 versus 3.50 days per month, p=0.13). However, neither PMHD nor change in PMHD over years, differed between expansion and non-expansion states (p>0.50 for all years).

**Conclusions:**

Individuals in states with state-run insurance marketplaces had fewer PMHD than individuals in states with federally-run marketplaces, possibly due to technical issues with the federally-run marketplace that delayed implementation. PMHD did not differ significantly between states with or without Medicaid expansion, perhaps due to factors other than insurance, such as lack of providers or transportation to services or the lack of a strict, clinical measure of mental health outcomes.

Table of Contents

[1.0 Introduction 1](#_Toc49963378)

[1.1 Mental Health in The United States 1](#_Toc49963379)

[1.2 Economic Impact of Mental Health 4](#_Toc49963380)

[1.3 Factors Related to Mental Health 6](#_Toc49963381)

[1.3.1 Overview of Factors 6](#_Toc49963382)

[1.3.2 Health Behaviors 7](#_Toc49963383)

[1.3.3 Provider Availability 8](#_Toc49963384)

[1.3.4 Health Insurance 8](#_Toc49963385)

[1.4 The Affordable Care Act 9](#_Toc49963386)

[1.4.1 Medicaid Expansion 9](#_Toc49963387)

[1.4.2 Insurance Marketplace Type 10](#_Toc49963388)

[1.4.3 Initial Effects of the ACA 13](#_Toc49963389)

[1.5 Gaps in Knowledge 13](#_Toc49963390)

[1.6 Specific Goals 16](#_Toc49963391)

[1.6.1 Overall Goals 16](#_Toc49963392)

[1.6.2 Specific Aim 1 17](#_Toc49963393)

[1.6.3 Specific Aim 2 18](#_Toc49963394)

[1.6.4 Specific Aim 3 19](#_Toc49963395)

[2.0 Materials and Methods 20](#_Toc49963396)

[2.1 Description of Data 20](#_Toc49963397)

[2.1.1 County Health Rankings and Roadmaps Data 20](#_Toc49963398)

[2.1.2 Selection of Datasets and the ACA Timeline 20](#_Toc49963399)

[2.1.3 Data Cleaning and Calculation of Means by State 22](#_Toc49963400)

[2.1.4 Study Population and Characteristics 24](#_Toc49963401)

[2.1.5 Statistical Analysis 26](#_Toc49963402)

[2.2 Results 27](#_Toc49963403)

[2.2.1 Mean Poor Mental Health Days by Expansion Status 27](#_Toc49963404)

[2.2.2 Health Insurance Marketplace 28](#_Toc49963405)

[2.2.3 Population Density 29](#_Toc49963406)

[2.2.4 Median Household Income 29](#_Toc49963407)

[2.2.5 Physical and Mental Health 29](#_Toc49963408)

[3.0 Discussion 32](#_Toc49963409)

[3.1 Results Discussion 32](#_Toc49963410)

[3.2 Study Limitations 34](#_Toc49963411)

[3.3 Conclusion 35](#_Toc49963412)

[Appendix A State Classifications 37](#_Toc49963413)

[Appendix B States Excluded From Physical and Mental Health Comparison 40](#_Toc49963414)

[Bibliography 41](#_Toc49963415)

List of Tables

[Table 1 Study Population Demographics 25](#_Toc49963416)

[Table 2 Mental and Physical Health by Expansion Status 27](#_Toc49963417)

[Table 3 Median Household Income by Expansion Statuss 29](#_Toc49963418)

List of Figures

[Figure 1 Map of Marketplace Types 23](#_Toc49963419)

[Figure 2 Poor Mental Health Days by Expansion Status 28](#_Toc49963420)

[Figure 3 Relationship Between Physical and Mental Health 31](#_Toc49963421)

[Figure 4 Relationship Between Physical and Mental Health by Expansion Status 31](#_Toc49963422)

.

# Introduction

As knowledge of genetics increases, so do the potential applications of genetics in the realm of public health. One promising area for the application of genetics is pharmacogenomics, in particular, the use of genetic knowledge to improve the efficacy of treatments for people with serious mental health disorders. Pharmacogenomics offers the possibility of identifying appropriate medications and doses based on an individual’s genotype. This result would enable medical prescribers to make more informed choices regarding prescriptions, thereby reducing prescription costs due to failed prophylaxis, as well as reducing the amount of time an individual would spend struggling with serious mental health disorders. The potential benefits of pharmacogenomics are large, but meaningless to people who do not have access to care. An important aspect of accessing care, for both mental and physical health, is having health insurance (Institute of Medicine (U.S.), 2002, Chapter 3). To effectively utilize pharmacogenomics for mental health treatment on a large scale, public health practitioners must understand and assess previous efforts to treat mental health at the population level. Identification of policies and practices that have improved the mental health of the population and which have been ineffective or even harmful so that we can develop future, evidence-based practices.

## Mental Health in The United States

Mental health issues affect a large proportion of the population in the United States based on the 2016 National Survey on Drug Use and Health (NSDUH) that was conducted by the Substance Abuse and Mental Health Services Administration (SAMHSA) (Substance Abuse and Mental Health Services Administration, 2017). The NSDUH was conducted as a face-to-face interview with both a preliminary screening phase and an interview phase. Participants were civilian, noninstitutionalized people living in the United States who were at least 12 years old. For recruitment and enrollment purposes, potential participants were categorized by age (adolescents- 12 to 17 years; young adults- 18 to 25 years; and adults- 26 years or older). The final enrollment was designed such that specific proportions of the study population came from each age category: 25% adolescent; 25% young adult; and 50% adult. To ensure a sample that was representative of the United States, a stratified multistage area probability was used. Results of the survey indicated that 18.3% of adults in the United States were affected by any mental illness (AMI), which include mental, behavioral, or emotional disorder that meet clinical DSM-IV clinical criteria. Survey results also indicated that 4.2% of adults in the U.S. experienced a “serious mental illness (SMI),” which included mental, behavioral, or emotional disorders severe enough to interfere with a person’s ability to function in their daily life. Among adults who reported having AMI, 23.2% experienced a serious mental illness. (Substance Abuse and Mental Health Services Administration, 2017)

Although the 2016 National Survey on Drug Use and Health was conducted on 67,942 individuals, it did not include people who were incarcerated, living in group or nursing homes, were homeless and did not access shelters, or were in mental institutions or long-term care hospitals at the time the survey was conducted. (Substance Abuse and Mental Health Services Administration, 2017). Because the National Survey on Drug Use and Health did not include people who were incarcerated or living in mental institutions, the prevalence of mental illness in the overall population may be higher than estimated. Reingle et al. (2014) performed a study of mental health of prisoners using data from the 2004 Survey of Inmates in State and Federal Correctional Facilities and from the 2004 Survey of Inmates in Federal Correctional Facilities. These studies used both in-person interviews and computer-assisted personal interviews to collect data from 14,499 state prisoners and 3,686 federal prisoners. Representative proportions of male and female prisoners were surveyed. More than 50% of people in prison are incarcerated for drug related crimes. To ensure that the study included individuals convicted of a variety of types of crimes, people in prison on drug-related charges were purposefully under-sampled. Based on their results, Reingle and colleagues estimated that, at some point in their lives, approximately 26.2% of prisoners had one or more mental health diagnoses (Reingle Gonzalez & Connell, 2014), compared to 18.3% of the non-institutionalized population. (Substance Abuse and Mental Health Services Administration, 2017).

The differentiation between jail and prison is not standard across all states; jails typically hold people who are awaiting trial or sentencing, or have committed misdemeanors with sentences less than one year. Prisons typically hold individuals who have committed felonies and/or have sentences lasting more than one year. (Bureau of Justice Statistics, n.d.). The 2011-2012 National Inmate Survey (NIS-3) administered one of two surveys and interviews to 106,532 inmates in state and federal prisons; jails; facilities in Indian country or military bases; and Immigration and Customs Enforcement facilities. The NIS-3 assessed current mental health in adults, both males and females, who were in jail or prison. Individuals in prison had a lower prevalence of a current mental health issues (14.5%) compared to in jail (26.4%); however, individuals in prison or in jail had a higher prevalence of current mental health issues compared to the general population (5%). People in jail also had a higher prevalence of having a history of mental health issues (44.3%) compared to people in prison (36.9%). Females in jail or prison had higher prevalences of current mental health issues (32.3% and 20.5%, respectively) than males in jail or prison (26.4% and 14.5%, respectively). This relationship also held for history of mental health issues: 67.9% of females in jails and 65.8 % of females in prison had a history of mental health issues, whereas, 40.8% of males in jail and 34.8% of males in prison had a history of mental health issues.

According to the National Survey on Drug Use and Health, among adults in the United States with any mental illness, 43.1% had received mental health treatment within the last year; a higher percentage (64.8%) of adults with serious mental illness had received mental health treatment within the last year (Substance Abuse and Mental Health Services Administration, 2017).

## Economic Impact of Mental Health

Poor mental health is associated with individual financial status, creating additional barriers to accessing care. In 2008, Kessler et al. analyzed data from the National Comorbidity Survey Replication (NCS-R) to investigate the economic impact of mental health issues. The NCS-R was conducted between February 2001 and April 2003 and included 9,282 face-to-face interviews of English-speaking adults in the United States, excluding Alaska and Hawaii, who were living in civilian households. Respondents were also asked to report personal earnings (income excluding unearned income) for the previous twelve months. The data analyses incorporated factors that are known to predict income (age, sex, race and ethnicity, Census region, and urbanicity). Statistical modeling using a generalized linear models (GLM) was done to estimate two values for predicted earning for each respondent. The first value was based on the characteristics of each respondent, including the presence of a serious mental illness. The second value assumed that the respondent did not have a serious mental illness. The mean difference in predicted individual income when a serious mental illness was present versus no mental illness was estimated. This mean difference was then multiplied by the estimated prevalence of serious mental illness in non-institutionalized, civilian adults aged 18 to 64 years in the United States. Kessler et al. (2008) estimated that people with a serious mental health disorder earned, on average, $16,306 per year less than people without a serious mental health disorder. Furthermore, this difference translated to over $193 billion in lost wages annually due to serious mental health disorders in the United States. (Kessler et al., 2008).

A longitudinal study by Hudson (2005) examined hospital discharge data for people who had experienced acute psychiatric hospitalization in Massachusetts between fiscal years 1994 and 2000. Zip codes for individuals’ home address at the time of first admission were used to determine socioeconomic status (SES). Using acute psychiatric hospitalizations as a measure for mental health, people who have a lower SES are more likely to have poor mental health. SES is negatively correlated with mental illness (-0.89). This study has several limitations, for example, individuals who had debilitating mental health issues but who were not hospitalized, were not included. (Hudson, 2005).

In summary, differences in prevalence of mental health disorders between different socioeconomic groups, combined with the financial impact of having at least one serious mental health disorder are likely to contribute to increased health and economic disparities throughout the country.

## Factors Related to Mental Health

### Overview of Factors

As mentioned briefly above, mental health is affected by a variety of factors, such as sex, age, and SES. In many cases, the relationship between mental health and other factors may be bidirectional and causation may be difficult, if not impossible, to fully establish. For example, Bulloch and colleagues (2009) conducted a 10-year longitudinal study to investigate the bidirectional relationship between major depression and disrupted marital status. They sought to understand how major depression might lead to divorce or separation, as well as how divorce or separation influenced major depression. Having major depression did not affect the likelihood that an unmarried couple would enter a marriage (including common-law marriage), or that a couple in a common-law marriage would become formally married. The presence of major depression in a marriage (including common-law marriage) compared to marriages in which neither partner experienced major depression was significantly associated with marital disruption (hazard ratio = 2.0; 95% confidence interval: 1.4-2.9; p<0.001). Individuals who had experienced marital disruption but had not previously had major depression were also monitored for the development of major depression. Bulloch and colleagues found marital disruption had a hazard ratio of 1.3 (95% confidence interval: 1.1-1.6; p=0.04) for the development of major depression when compared with people not experiencing marriage disruption. Thus, major depression is a risk factor for marital disruption and marital disruption is a risk factor for major depression. (Bulloch, Williams, Lavorato, & Patten, 2009).

### Health Behaviors

Health behaviors play important roles in a person’s health and well-being and may influence whether or not a person develops a disease, management of disease, susceptibility to complications, and, ultimately, death due to the disease. Having insurance can enable a person to seek preventative care and may influence their health behaviors. For example, health behaviors differ significantly between states that had Medicaid expansion and states that did not. Compared to states that expanded Medicaid coverage, those that did not expand Medicaid coverage reported higher rates of smoking, obesity, and physical inactivity; whereas states that expanded Medicaid had higher rates of individuals drinking alcohol (Rhubart, 2018). The National Alliance on Mental Illness estimates that people with mental illness and/or a substance use disorder smoke up to 44.3% of all cigarettes ("Tobacco and Smoking | NAMI: National Alliance on Mental Illness", 2018). Simon and colleagues (2006) reported that obesity is correlated with a 25% increased risk of having a mood or anxiety disorder (Simon et al., 2006). In contrast, participating in regular physical activity may reduce anxiety and depression, among other health benefits. The relationships between mental health and smoking, obesity, and physical inactivity are convoluted and complicated. In some cases, mental health may be causal or contributing; in other cases, poor mental health may be secondary to the behaviors. Overall, the states that did not expand Medicaid have higher rates of health behaviors that are more closely associated with poor mental health, with the exception of drinking alcohol.

### Provider Availability

In the past, insurance plans were not required to include mental health treatment. The ACA defines mental health treatment as an Essential Health Benefit (EHB) which includes efforts to identify people needing treatment earlier in order to prevent major mental health issues or crises. EHBs are required in all plans sold through the Insurance Marketplace. Including mental health in the ACA’s EHBs resulted in expanding access to care across the country. However, health insurance may help improve access to mental health care only if mental health providers are available; an estimated 91 million Americans live in areas lacking an adequate mental health workforce (Jones et al., 2017). Geographic regions are considered to have a shortage of mental health providers if less than one psychiatrist is present per 30,000 people living in the region. Thus, even for people with insurance, significant waiting periods will result between the occurrence of the need for mental health care and the availability of mental health care.

This shortage of providers may be addressed in numerous ways, including the employment of psychiatric mental health advanced practice nurses (PMH APNs). PMH APNs are trained in clinical psychiatry and nursing and are able to conduct assessments, diagnose, and treat patients with mental health concerns (Delaney, 2017).

### Health Insurance

Lacking health insurance or being unable to afford out of pocket health care costs are devastating barriers to health and health care, thus, health insurance is associated with longer life. Wilper and colleagues (2009) estimated that nearly 45,000 deaths each year were associated with a lack of health insurance. Lacking health insurance, when controlling for age and gender, had a hazard ratio of 1.80, a significant increase in the risk of mortality for individuals who did not have health insurance. When Wilper and colleagues adjusted for other factors (age, gender, race and ethnicity, poverty income ratio, education, unemployment, smoking, regular alcohol use, self-rated health, physician-rated health, body mass index), the hazard ratio of death for lacking insurance was 1.40. (Wilper et al., 2009).

## The Affordable Care Act

### Medicaid Expansion

In 2010, the federal government passed the Affordable Care Act (ACA) to improve access to health care for all Americans, including an emphasis on improving access to health care for people who were uninsured, among other groups *(Patient Protection and Affordability Act, 2010)*. This reduction was accomplished primarily through the expansion of Medicaid to cover adults with incomes below 138 percent of the federal poverty level (FPL). Medicaid eligibility requirements varied by state. The ACA’s original wording required that all states expand their Medicaid coverage. This component was quickly challenged in court as unconstitutional (*National Federation of Independent Business v. Sebelius)* and ruled as such by the Supreme Court in 2012 (Rhubart, 2018). Subsequently, not all states chose to expand their Medicaid coverage, potentially increasing overall health disparities between states. By comparing several mental health indicators and measurements, the effectiveness of Medicaid expansion on the mental health in each state may be assessed. Knowing how Medicaid expansion affects mental health on a state population level may be useful in future policy decisions affecting people’s ability to access mental health services. Potential policy decisions influenced by this information may include policies surrounding Medicaid expansion and Medicaid eligibility criteria, as well as policies governing what insurance policies must include in coverage. Additionally, by looking at the availability of mental health providers, health practitioners and policymakers may gain insight into the adequacy of mental health workforce is adequate, as well as the gaps in the availability of care.

### Insurance Marketplace Type

The ACA includes a provision for online insurance marketplaces, where individuals can compare and purchase private insurance plans, determine eligibility for premium tax credits or cost sharing subsidies, and determine eligibility for Medicaid or the Children’s Health Insurance Plan (CHIP). According to the Kaiser Family Foundation (2018), premium tax credits are intended to reduce the monthly cost of health insurance premiums and are available to U.S. citizens or legal residents who have an annual income that is 100-400% of the Federal Poverty Level (FPL), do not have affordable coverage through an employer, and do not qualify for programs such as Medicaid or CHIP. Cost sharing subsidies are intended to reduce the out-of-pocket expenses incurred when a person receives medical care. Insurances plans are categorized into “bronze,” “silver,” “gold,” and “platinum,” which indicate how much a person can expect to pay in insurance premiums versus out-of-pocket copays; premium tax credits can be applied towards any of these levels, but cost sharing subsidies are only applicable towards silver-level plans. (Kaiser Family Foundation, 2018-a).

Currently four possible types of marketplaces exist: state-based; state-based marketplace with federal platform; state-partnership; or federally-run marketplaces. State-based are marketplaces in which the state is responsible for all functions of the marketplace. States with their own marketplaces must establish and maintain the website in working order, accessible through state-specific websites. State-based marketplaces with federal platforms are marketplaces in which the state is responsible for the various functions of the marketplace, but they use federally facilitated marketplace technology. State-partnership marketplaces are marketplaces in which the state is responsible for managing plans that are sold through the marketplace and in-person customer service, with all other functions of the marketplace falling on the Department of Health and Human Services (HHS). Finally, federally-run marketplaces are marketplaces in which HHS takes responsibility over all marketplace functions. State-based with federal platform, state-partnership, and federally-run marketplaces are all accessible through healthcare.gov. (Kaiser Family Foundation, 2019). Since the underlying technical aspects in these three types are all the same, that is, federally managed technology, any state with one of these types of marketplace is considered to be using a federal marketplace.

The Health Insurance Marketplace officially opened on October 1, 2013. Currently, 12 states (California, Colorado, Connecticut, District of Columbia, Idaho, Maryland, Massachusetts, Minnesota, New York, Rhode Island, Vermont, and Washington) utilize state-run marketplaces (HealthCare.gov, 2018). Of these 12, Idaho is the only state to choose not to expand Medicaid prior to December 31, 2015. Insurance marketplaces allow people to compare and purchase insurance plans. The number of individuals who enrolled through online marketplaces is categorized by the year in which coverage is effective. The Centers for Medicare and Medicaid Services (CMS)’s final report on enrollment for 2018 (2018) reported that 8.0 million people enrolled in an insurance plan through an insurance marketplace for 2014 coverage, 2.6 million of these people used a state-run marketplace. Total enrollment using marketplaces for subsequent years were: (a) in 2015, 11.7 million people (2.8 million state-run) (b) in 2016, 12.7 million (3.2 million state-run), (c) in 2017, 12.2 million (3.0 million state-run) and (e) in 2018, 11.8 million (3.0 million state-run). The CMS report showed that the length of time of the Open Enrollment Period (OEP), during which anyone can use the marketplace to enroll in health insurance, has been decreasing each year. The first OEP began October 1, 2013, and ended April 19, 2014, while the OEP for 2018 began November 1, 2017 and ran only until December 15, 2017. (Centers for Medicare and Medicaid Services, 2018).

An issue brief on the first OEP was released by the Assistant Secretary for Planning and Evaluation (ASPE)(2014) two months after the OEP ended. The ASPE reported that, during the first OEP (2014), 53% of people enrolling in an insurance plan through a state-run marketplace were female, while 55% of people enrolling through the federal marketplace were female. Fifty-eight percent of people using a state-run marketplace chose a silver plan, compared to 69% using the federal marketplace. Both types of marketplaces had similar proportions of the population that were determined eligible for financial assistant, with 82% of state-run and 86% of federal-run marketplace users receiving financial assistance for their insurance plan. The ASPE also reported that there were 31,109,693 visits to state-run marketplace websites and 67,223,662 visits to the federal marketplace website. Data on race and ethnicity were collected as part of the federal marketplace and included in the ASPE’s report. When excluding “unknown” race and ethnicity, 0.3% of people enrolling in a plan from the federal marketplace were American Indian/Alaska Native, 7.9% were Asian, 0.1% were Native Hawaiian or Pacific Islander, 16.7% were African-American, 10.7% were Latino, 62.9% were white, and 1.3% were multiracial. (The Assistant Secretary for Planning and Evaluation, 2014). The proportions of enrollment for each racial and ethnic group are similar to the proportions reported in the 2015 data set used for this study, with lower rates of American Indian/Alaska Natives (0.2%) and Latinos (listed as Hispanic in the data)(17.1%) enrolling than are present in the population, and higher rates of African Americans (12.4%) enrolling. The data do not include how many people identify as multiracial.

### Initial Effects of the ACA

The ASPE (2016) released an issue brief on the ACA’s impacts on health insurance coverage. In the brief, the ASPE stated that the ACA has led to a decrease in the rate of uninsured adults in America, from 22.2% of non-elderly adults being uninsured in 2010, to 13% in 2015. Expansion states had a decrease of 9.9 percentage points in the rate of uninsured non-elderly adults between 2010 and 2015, while non-expansion states had an 8.2 percentage points decrease. The ASPE brief investigated changes in the uninsured rate in different income groups and found a 39% decrease for people with incomes less than 100% of the FPL, 48% decrease for 100-125% of FPL, 41% decrease for 250-400% of FPL, and 42% decrease for greater than 400% of FPL. (The Assistant Secretary for Planning and Evaluation, 2016). Following the implementation of the ACA, the U.S. had the largest decrease in the number of uninsured since the implementation of Medicaid and Medicare, dropping from 49 million in 2010, to 29 million in 2015 (Obama, 2016).

## Gaps in Knowledge

Limited research has been done on the impacts of the Affordable Care Act on mental health in the United States. Saloner, Sachini, Bachhuber, and Barry (2017) studied the effect of the ACA on insurance coverage and the use of treatment for adults with mental illnesses and substance use disorders using data from the NSDUH for 2011 through 2014, using 2011-2013 as the baseline for comparison. The percent of uninsured adults among those with a mental illness declined from 21.3% to 15.9% (p<0.01). Among individuals with an income less than or equal to 200% of the federal poverty line, the proportion of uninsured adults with mental illness decreased from 33.2% to 23.1%. The portion of adults with mental illness who received treatment increased from 43% in 2011-2013 to 45.1% in 2014 (p=0.04). (Saloner, Bandara, Bachhuber, & Barry, 2017)

The ACA enabled adult dependents to remain under a parent’s insurance plan, either through an employer or privately purchased, until the dependent reached the age of 26 (U.S. Department of Labor, 2016). Burns and Wolfe (2016) examined the effects of this requirement by comparing changes in mental health in 23-25 year olds and 27-29 year olds. The 23-25 year old group was used because members of this group may be insured through their parents’ insurance as adult dependents under the ACA; the 27-29 year old group was used as the control. Data were taken from the Medical Expenditure Panel Survey (MEPS) for 2007 through 2009 and 2011. The MEPS collects information about health insurance coverage, utilization of health care, and the health status for all members of a household through a series of five interviews, which are completed over the course of two years, as well as through self-administered questionnaires. The unadjusted proportion of individuals aged 23-25 years old who were insured increased from 72% to 80% (p<0.01). After adjustment, the proportion of 23-25 year olds with insurance increased by 7 percentage points (p<0.01). In contrast, the unadjusted proportion of individuals who were insured in the 27-29 year old group, increased from 75% to 76% (p=0.59). Overall mental health was assessed through self-reporting; participants classified their mental health as “excellent,” “very good,” “good,” “fair,” or “poor.” A “mental component score,” screen for the presence of depression, and a screen for the presence of serious psychological distress were also incorporated. The study results indicated no significant change in how participants rated their own mental health for the 23-25 year old group (p=0.18) or the 27-29 year old group (p=0.25) before and after the implementation of the ACA. The 23-25 year old group had an increase in the mean mental component score (49.09 increased to 51.23, p<0.01), indicating an improvement in mental health; the older group did not have significant change (49.55 increased to 49.63, p=0.46). Younger individuals had a significant change in the number of positive screens for depression (p=0.05), while older individuals did not (p=0.52). Neither the younger nor older groups had significant changes in the number of positive screens for serious psychological distress. The improvement in the mental component score for the younger group is evidence that enabling adult dependents to remain insured through their parents’ health insurance may have provided a small benefit to mental health. (Burns & Wolfe, 2016).

Winkelman and Change (2018) investigated the effects of the ACA on the health (measured as presence of absence of chronic conditions) of low-income (less than 138% Federal Poverty Level) adults who did not have children. BRFSS data for 2011-2015 were used to analyze several outcomes, including general health, poor physical health, poor mental health, disability, and insurance coverage. The study used a difference-in-differences (DID) approach to compare changes in outcomes between Medicaid expansion states and non-expansion states. A negative DID coefficient indicates a decrease in a given measure for expansion states, whereas a positive DID coefficient indicates an increase in a given measure for expansion states. In low-income, childless adults who did not have a chronic condition, the number of poor physical health days per month (DID= 0.08, p=0.74) and poor mental health days per month (DID=-0.23, p=0.38) did not differ significantly between expansion and non-expansion states. In low-income, childless adults with a chronic condition, significant differences were observed between expansion and non-expansion states in number of poor physical health days per month (DID= -1.2, p<0.001) and number of poor mental health days per month (DID=-1.1, p<0.001). Although the mean number of poor physical health days did not change for those with chronic conditions, the number of days limited by poor health per month in expansion states compared to non-expansion states was significantly lower (DID=-0.94, p<0.001). (Winkelman & Chang, 2018).

Results from the current literature indicates that the ACA has had an impact on the rate of uninsured people, proportion of people receiving care, and mental health outcomes. However, studies on the effects of the ACA have focused on specific conditions or subpopulations. In the current study I assessed whether the ACA had an impact on mental health, across the entire US population.

## Specific Goals

### Overall Goals

The overall goal of this study was to identify whether the Affordable Care Act (ACA) has had an impact on mental health. As of December 31, 2015, 29 states had expanded Medicaid coverage, while 21 had not ("Status of State Action on the Medicaid Expansion Decision", 2018). By comparing differences in the number of uninsured people, mental health outcomes, and number of mental health providers for each state before and after the implementation of Medicaid expansion, and then comparing these differences among states, I assessed whether Medicaid expansion has had a measurable effect on mental health. I also examined the relationship between physical and mental health. The relationship between physical and mental health may lead to improvements in the mental health of people who have Medicaid as a result of Medicaid expansion, without those people actually receiving mental health-specific care.

### Specific Aim 1

I categorized and compared characteristics of each state. The United States covers a vast amount of territory and states are not homogenous. Although many characteristics vary by region within each state, I assessed each state as a single entity. I assessed the following characteristics: total population, median income, proportion of the population living in poverty, and rate of uninsured adults. I also identified the mean poor mental health days per each state and grouped states into “non-expansion” and “expansion” states. Non-expansion states are states that did not implement Medicaid expansion on or before December 31, 2015. Expansion states are states that implemented Medicaid expansion by that date.

The differences among states for the characteristics listed above were used to examine possible other factors contributing to poor mental health days in each state, including total population and total area of the state to calculate overall population density and its possible effects on mental health. When investigating the efficacy of public health policies, ensuring that health disparities are not misattributed or over-attributed to factors thought to play a role in the development of disparities is critical. Therefore, I included variables in addition to Medicaid expansion status, to assess the possible effects Medicaid expansion may have on mental health.

### Specific Aim 2

Medicaid expansion was only one part of the ACA that may have influenced overall physical and mental health of the population. The ACA also included a mandate for individuals to have insurance coverage. To assess the overall effect of the individual insurance mandate on mental health, I analyzed and compared mental health data for 2011 and 2015. Additionally, states were characterized by whether they chose to build their own Marketplace or if they chose to instead use the Federal Marketplace. Marketplaces are websites on which individuals who do not have insurance through an employer can compare and purchase private insurance plans. States were given the choice of either using the Federal Marketplace or building a state-run insurance marketplace to allow individuals to purchase health insurance plans. A few states attempted to build their own Marketplace before ultimately using the Federal Marketplace. These states were classified as using the Federal Marketplace, but I also assessed whether this change caused any delays in opening enrollment to the general public and the length of these delays.

Differences between state-run marketplaces and the Federal Marketplace may have had an effect on the ability of people to navigate through the insurance enrollment process. States that tried and failed to implement their own marketplace may have inadvertently made it more difficult for the general public to purchase health insurance or may have had effectively shorter enrollment periods for people to purchase insurance. In analyzing if the ACA had an overall impact on mental health, I compared states based on type of marketplace, as well as when the marketplaces were functional and available, to identify any possible differences in mental health between these states.

### Specific Aim 3

Mental health can be subjective, often leading to difficulty in quantifiably analyzing mental health outcomes. To look at how Medicaid expansion may have influenced mental health outcomes, I used the “poor mental health days” variable included in the County Health Rankings data. This variable is the mean number of poor mental health days reported by participants in the Behavioral Risk Factor Surveillance System (BRFSS). BRFSS collects data on 400,000 adults across the country annually through telephone surveys (Centers for Disease Control and Prevention, 2018). The data are available publicly. Because BRFSS is based on self-reports, the reported number of poor mental health days may not reflect clinical criteria. Because I am looking at change in mental health outcomes in general terms, the lack of clinical validation may not be critical. As long as the BRFSS survey questions were consistent across years, the large sample size should be sufficient to override any individual variation in what a participant considers a “poor mental health day.” As part of this analysis, I assessed the effect of Medicaid expansion on mental health of the population.

# Materials and Methods

## Description of Data

### County Health Rankings and Roadmaps Data

The data analyzed in this study originate from the County Health Rankings & Roadmaps program. The goal of this program is to improve health by increasing awareness of what factors may influence health, engaging communities to create a sustainable change towards healthier practices, empowering community leaders in their local work, and providing data so communities can use evidence-based practices to improve health. Data are compiled annually by the program from several sources and are available on the County Health Ranking website (countyhealthrankings.org), free for public use. Health rankings and other health measure data are included for all counties in the United States and the District of Columbia; U.S. territories are not included. The health measure data were collected at the county level and were used to compare states that did and did not choose to expand Medicaid coverage.

### Selection of Datasets and the ACA Timeline

In selecting data sets, I considered the implementation timeline of the ACA. The ACA was signed by President Barack Obama on March 23, 2010. To determine a baseline of mental health in states prior to the ACA, the data from 2011 were used. Although the ACA was law by 2011, insufficient time had elapsed between the ACA being signed into law and implementation for the ACA to have had an impact on policies governing health. The data from 2011 are an appropriate baseline, because they represent the health of the American people on the eve of ACA implementation, reducing the chance of other factors creating a change in mental health than if older data were used.

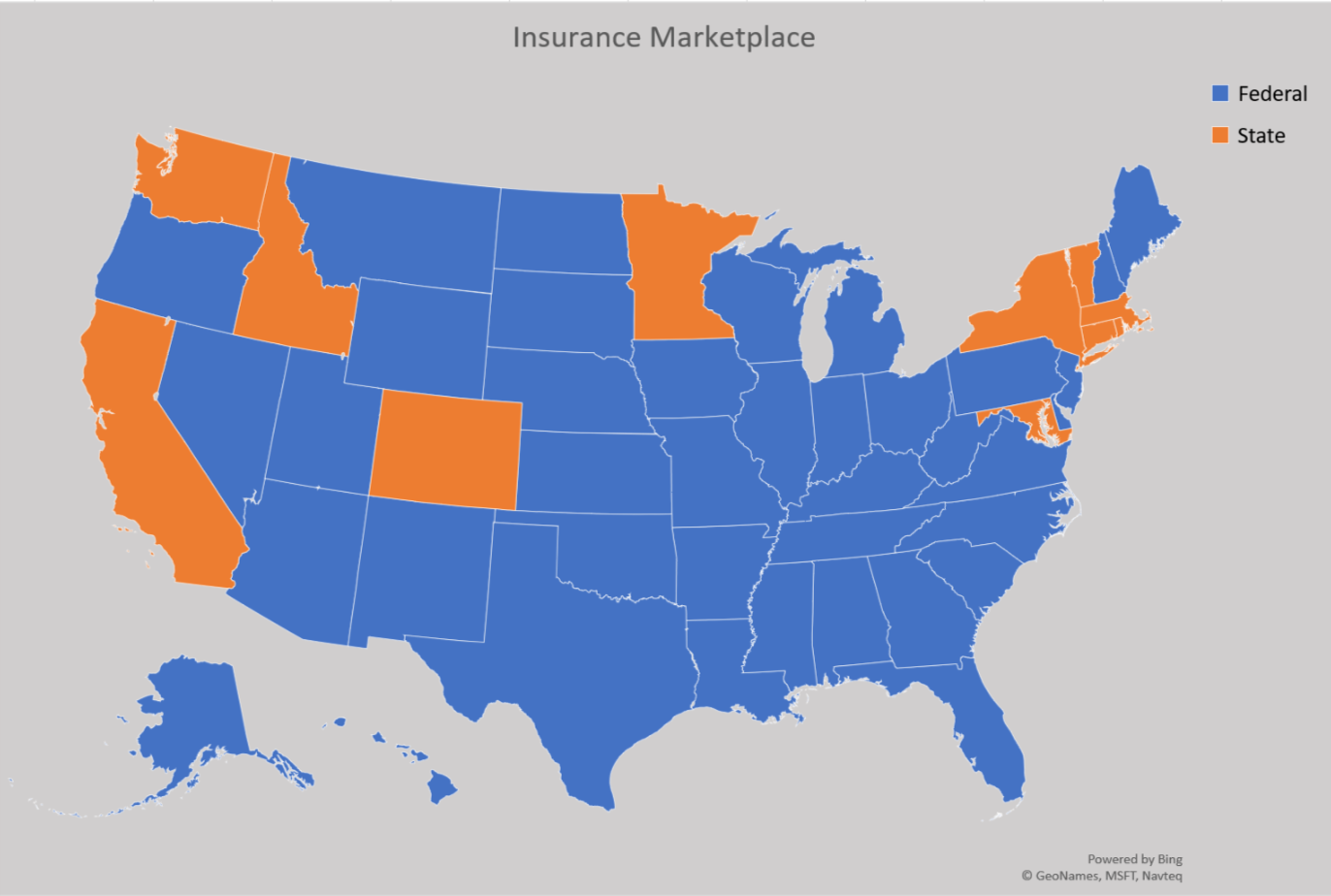
One of the most well-known components of the ACA is the Insurance Marketplace, which was intended to create a single place for consumers to compare and purchase insurance plans, as well as for consumers to see if they would be eligible for subsidies or other cost-reducing programs. The Health Insurance Marketplace officially opened on October 1, 2013.Critics and proponents of the ACA cite many issues with using the Marketplace. To account for the time it took for the Marketplace to become more widely used and plans purchased on the Marketplace to go into effect, the data set from 2015 was chosen. This interim data set was used to assess if trends in mental health could be identified earlier on during the ACA’s implementation. When examining policies or interventions, knowing how long an intervention needs to be in place before any outcomes would be observed is critical. If the ACA can be improved upon or used as a model for future efforts to improve access to mental health care, we need to better understand this time frame to be able to evaluate changes to the ACA or similar programs and policies.

The final data set used was the data set published in 2018. A large portion of these data were collected in 2016, before some states adopted Medicaid expansion. To ensure that states were being compared on the Medicaid expansion status that reflected the time period represented by the data, Medicaid expansion status as of December 31, 2015 were used. Information on expansion status by state was collected from the Kaiser Family Foundation (Kaiser Family Foundation, 2018-b). Any state that expanded Medicaid coverage after that date was defined as a non-expansion state. Therefore, not all states that have expanded or are working to expand Medicaid coverage are included in the list of states with Medicaid expansion. Montana and Louisiana expanded Medicaid coverage effective after December 31, 2015; Virginia had a planned implementation date of January 1, 2019; Maine voted to expand coverage, but has failed to meet state plan amendment submission deadlines (Kaiser Family Foundation, 2018-b). In November 2018, 60.6 percent of Idaho voters voted in favor of Proposition 2, approving Medicaid expansion for Idaho (Idaho Secretary of State Office, 2018). In that same election, Nebraska’s ballot included Measure 497, which would amend the state statutes to include Medicaid expansion ("Initiative Measure 427", 2018). 53.2% of Nebraska voters chose to expand Medicaid (Nebraska Secretary of State Office, 2018).

### Data Cleaning and Calculation of Means by State

Data were cleaned in Microsoft Excel and then imported into Stata for statistical analysis. The mean poor mental health days (PMHD) per month were available for each county for the 2011 and 2015 data sets. From these data, the overall mean PMHD for each state were calculated by multiplying the mean PMHD per county by the number of respondents in each county, summing the PMHD across the counties in each state, and dividing by the total number of respondents in each state. The 2018 data did not include the number of respondents per county, so data were retrieved directly from the BRFSS website and the mean PMHD per state was calculated directly. States were classified as “non-expansion” or “expansion,” and the minimums, maximums, modes, and means were found for non-expansion and expansion (**Table 2 Mental and Physical Health by Expansion Status**). Three timescales were used to investigating the changes in PMHD between years: the change from 2011 to 2015; the change from 2015 to 2018; and the overall change from 2011 to 2018. The first was used to measure the change based on the implementation of the insurance marketplaces; the second was used to measure the change from the time when marketplaces were implemented to wide-spread Medicaid expansion; and the third was used to measure the overall change in PMHD after both the marketplace implementation and Medicaid expansion.

States were categorized as either having a state-run or a federally-run health insurance marketplace: 12 states had state-run marketplaces of which Idaho was the only state which had not chosen to expand Medicaid (**Figure 1 Map of Marketplace Types**). Two characteristics (rate of uninsured adults and median household income) that have been hypothesized to influence access to mental health care were analyzed to identify possible factors that could account for the initial difference and later similarity in PMHD.



**Figure 1 Map of Marketplace Types**

Map of the United States based on marketplace type. 12 states (California, Colorado, Connecticut, District of Columbia, Idaho, Maryland, Massachusetts, Minnesota, New York, Rhode Island, Vermont, Washington) were classified as “state-run.” All other states were supported, in some way, by the federal government (See *0*).

Population density was determined for each state using land area data taken from the 2010 U.S. Census (Census Bureau, 2018). The Census also provides these data for the entire area in a given state, including bodies of water and glaciers, which could lead to differences in measurements between this and other studies. State population density was calculated by dividing the number of people per state by the land area of that state and was measured in people per square mile. States were again classified as non-expansion or expansion. Both groups had a large amount of variation and range in the population density. Non-expansion states ranged from 6.030 people/m2 (Wyoming), to 384.381 people/m2 (Florida); expansion states ranged from 1.300 people/m2 (Alaska), to 11,166.721 people/m2 (Washington, D.C.).

### Study Population and Characteristics

Self-reported health measures included in the County Health Rankings & Roadmaps data sets were compiled from the Behavioral Risk Factor Surveillance System (BRFSS). This includes mentally unhealthy days per month (poor mental health days), physically unhealthy days per month (poor physical health days), and smoking status. The BRFSS collects data via telephone surveys of more than 400,000 people in America. Other data, including demographic data, were collected from the U.S. Census. Between 2011 and 2018, the population grew by 16,120,963 people. Demographic variables included age (under 18 years old or over 65 years old), race and ethnicity, gender, and amount of the population living in rural areas. The BRFSS and U.S. Census data were obtained for each county. I combined data across counties to obtain demographics for the overall population (Error! Reference source not found.). The data in 2011 did not include the option of “Non-Hispanic White,” however this was included for 2015 and 2018. As can be seen, between 2011 and 2018, the proportion of individuals less than 18yo decreased (24.3% to 22.8%), and the proportion ≥65yo increased (12.9% to 15.2%). The proportion of African Americans and non-Hispanic Whites decreased, whereas the proportion of other groups increased. Also, the proportion of individuals living in rural areas decreased from 20.7% to 18.4%.

**Table 1 Study Population Demographics**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **2011** | **2015** | **2018** |
| Under 18 yo | 24.3% | 23.3% | 22.8% |
| Over 65 yo | 12.9% | 14.1% | 15.2% |
| African American | 18.4% | 12.4% | 12.4% |
| American Indian/Alaskan Native | 1.0% | 1.2% | 1.3% |
| Asian | 4.6% | 5.3% | 5.7% |
| Native Hawaiian/Other Pacific Islander | 0.2% | 0.2% | 0.2% |
| Hispanic | 15.8% | 17.1% | 17.8% |
| Non-Hispanic White | -- | 62.6% | 61.3% |
| Not Proficient in English | 8.6% | 4.2% | 4.1% |
| Female | 50.7% | 50.7% | 50.8% |
| Live in  Rural Area | 20.7% | 18.8% | 18.4% |

Demographic information for the U.S. population per each data set used in the study. Non-Hispanic

White was not included in the 2011 data.

### Statistical Analysis

T-tests were used to assess possible differences between the changes in mean poor mental health days in non-expansion versus expansion states, as well as differences in mean poor physical health days by expansion status. For 2011, 2015, and 2018, I estimated the correlation coefficient was used to measure the relationship between physical and mental health, regardless of expansion status, but after excluding outliers. This analysis was then repeated based on expansion status for all three years.

The percentage of uninsured adults in each state was compared between the state-run and federally-run marketplaces using a proportion test (**Error! Reference source not found.**). The median household income between the two groups was compared using a Kruskal Wallis median rank test.

A linear regression was done to assess any association between PMHD and population density in 2011 and 2018.

## Results

### Mean Poor Mental Health Days by Expansion Status

There was no difference in PMHD based on expansion status for 2011 (p=0.762); there was also no difference in 2015 (p=0.559); nor was there a difference for 2018 (p=0.723). Details on minimum and maximum PMHD can be found in **Table 2 Mental and Physical Health by Expansion Status**. There were also no significant differences in the changes in PMHD based on expansion status for 2011 to 2015 (t=-1.135, p=0.262), 2015 to 2018 (t=0.445, p=0.658), or 2011 to 2018 (t=-0.084, p=0.933).

**Table 2 Mental and Physical Health by Expansion Status**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Mean Poor Mental Health Days  (min, max) | t-test statistic  (p-value) | Mean Poor Physical Health Days  (min, max) | t-test statistic  (p-value) |
| Non-Expansion States (2011) | 3.41  (2.6, 4.5) |  | 3.39  (2.93, 3.94) |  |
| Expansion States (2011) | 3.37  (2.5, 4.6) | -0.305  (0.762) | 3.55  (2.86, 4.95) | 1.57  (0.12) |
| Non-Expansion States (2015) | 3.48  (2.5, 4.3) |  | 3.68  (2.88, 4.43) |  |
| Expansion States (2018) | 3.40  (2.5, 4.6) | -0.588  (0.559) | 3.42  (1.51, 5.15) | -1.61  (0.11) |
| Non-Expansion States (2018) | 3.49  (2.6, 4.3) |  | 3.75  (3.05, 4.54) |  |
| Expansion States (2018) | 3.44  (2.4, 4.7) | -0.357  (0.723) | 3.59  (2.85, 5.0) | -1.17  (0.25) |



**Figure 2 Poor Mental Health Days by Expansion Status**

The mean Poor Mental Health Days (PMHD) are shown for expansion and non-expansion states.

### Health Insurance Marketplace

There were no significant differences between PMHD in state-run marketplaces compared to federally-run marketplaces in 2011 (3.24 days per month versus 3.43 days per month, t=1.205, p=0.234), 2015 (3.26 days per month versus 3.48 days per month, t=1.394, p=0.170), or 2018 (3.36 days per month versus 3.50 days per month, t=0.875, p=0.386). States with federally run marketplaces had significantly higher proportions of adults without insurance (9.97% versus 14.96%, p=0.003). There was also a significant difference in median household income between states with state-run and federally-run marketplaces ($57,668.04 versus $48,264, Χ2= 5.540, p=0.019) for 2018. Median household income for 2011 and 2015 were not analyzed.

### Population Density

Linear regression analyses did not indicate any significant differences in PMHD by population density for 2011 (p=0.344) or 2018 (p=0.780).

### Median Household Income

Using a Kruskal Wallis median rank test, median household income was significantly different among counties based on expansion status (p=0.0001).

Table 3 Median Household Income by Expansion Statuss

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Mean | Standard Deviation | Minimum | Maximum |
| Non-Expansion States | $47,288 | $11,784.39 | $22,045 | $134,609 |
| Expansion States | $52,442 | $13,665.07 | $23,115 | $119,386 |

Median Household Income was provided at the county level and was not compiled at the state level for analysis. Counties were classified as non-expansion or expansion. 1,780 counties classified as non-expansion and 1,361 counties classified as expansion.

### Physical and Mental Health

As can be seen in **Table 2 Mental and Physical Health by Expansion Status**, for 2011, non-expansion states had a mean of 3.39 poor physical health days per month, which was not significantly different from expansion states (3.55 poor physical health days per month, t=1.572, p=0.122). The number of poor physical health days did not differ between non-expansion (3.68 days per month) and expansion states (3.42) for 2015 (t=1.612, p=0.113). Finally, the mean number of poor physical health days per month did not differ between non-expansion states for 2018 (3.75 days per month) and expansion states (3.59 days per month, t=-1.169, p=0.248).

Analysis of the change in mean poor physical health from 2011 to 2015 significantly differed between expansion and non-expansion states (t=-2.49; p=0.016). However, the change in mean poor physical health days did not differ between non-expansion and expansion states for 2015 to 2018 (t=0.835; p=0.408). Furthermore, change in mean poor physical health days was marginally significant(t=-1.992; p=0.051) between non-expansion and expansion states for 2011 to 2018. These analyses were re-done after removing states whose change in poor physical health were outliers compared to the other states. All outliers removed were expansion states (Kentucky, Oregon, New Mexico, West Virginia); details for these states the change in mean poor physical health days between non-expansion and expansion states still differed significantly for 2011 to 2015 (t=-3.158; p=0.003), but not for 2015 to 2018 (t=0.776; p=0.44). The change in poor physical health between the two groups for 2011 to 2018 was significant after removing outliers t=-2.688; p=0.010).

Mean poor mental health days per month were loosely correlated with mean poor physical health days for 2011, although this was not statistically significant (r=0.20, p=0.17). Mean poor mental health days per month were positively and significantly correlated with mean poor physical health days for 2015 (r=0.87, p<0.001) and 2018 (r=0.85, p<0.001) when expansion status was not considered (

**Figure 3**). Positive correlations were also observed when states were stratified by expansion status (**Figure 4 Relationship Between Physical and Mental Health**). In 2011, the correlation between mean PMHD and mean PPHD was low in both non-expansion states and expansion states; r=0.14 and r=0.35, respectively). In 2015, the correlation was high and similar in non-expansion and expansion states (r=0.87 and r=0.89, respectively). Similarly, the correlation was also high in 2018: r= 0.91 for non-expansion states and 0.80 for expansion states.



**Figure 3 Relationship Between Physical and Mental Health**



**Figure 4 Relationship Between Physical and Mental Health by Expansion Status**

# Discussion

## Results Discussion

Limited research has been done on the possible effects of the ACA on mental health, or of the possible effects of Medicaid expansion on mental health. The aims of this study were: 1.) analyze characteristics of states that may be linked to mental health and access to care, and compare them between expansion and non-expansion states; 2.) analyze differences in federally-run and state-run insurance marketplaces and the overall impact the individual insurance mandate of the ACA may have had on mental health; and 3.) investigate any differences in mental health that may be attributed to Medicaid expansion.

Results of my analysis indicated no significant difference in mean PMHD among states by expansion status (p>0.56 for 2011, 2015; p=0.72 for 2018), nor were there significant differences in the changes in PMHD across years between the two groups (p>0.26 for all comparisons). Similarly, I observed no significant differences in mean poor physical health days (PPHD) among states by expansion status (Table 2). In contrast, the change in PPHD across years differed by expansion status, especially after removal of data outliers. For example, mean PPHD increased for between 2011 and 2018 in non-expansion states, but did not change between 2011 and 2018 in expansion states (p=0.010)

Mean PMHD did not significantly differ by type of health insurance marketplace (state versus federal) in 2011, 2015, or 2018. However, compared to states with state-run insurance marketplaces, states with federal marketplaces had significantly higher proportions of adults without insurance (9.97% versus 14.96%, respectively), and median household income was significantly lower ($57,668 vs $48,264, respectively). Poor mental health has been associated with lower socioeconomic status, and people with serious mental health have an estimated total of $193 billion in lost wages per year (Kessler et al., 2008). Although income and insurance have been associated with access to mental health care, I did not detect any significant effects of type of insurance marketplace on mean PMHD. This result may be due to several reasons. First, the range of median household income varied extensively in both the expansion and non-expansion groups. Thus, a non-parametric analysis by categories may be more appropriate. Second, median household income as a measure does not account for the number of people in household that are dependent upon that income, thus, it is a less than ideal measure of how socioeconomic status influences and is influenced by mental health. Possibly, the introduction of the ACA may have served to improve PMHD in states with federally-run marketplaces by making access to care more similar to the level of access seen in states with state-run marketplaces prior to the ACA.

Population density did not appear to influence PMHD. However, population density among states varied extensively for both expansion and non-expansion states. For example, Washington D.C. has a population density (11,166.72 people/m2) that is nearly ten times higher than the next population density (New Jersey; 1,216.273 people/m2). Mean population density of a state also does not account for variability within states themselves. States often have concentrated areas of high population density as well as areas with sparse population. The measure of overall population density on the state level only considers total population and total area, rather than actual density in various parts of each state. In the future, analysis of population density by three categories ( low, medium, and high density) may be more beneficial, or another measure that includes weights for different regions, may be more informative.

Across all three years that I analyzed, poor physical health and poor mental health were positively correlated. Initially, the correlation between physical and mental health was higher in expansion versus nonexpansion states, r=0.35 versus 0.14, respectively. However, by 2018, the non-expansion states had a higher correlation between physical and mental health than did expansion states, r=0.91 versus 0.80, respectively. Prior to the ACA, there was no requirement for health insurance companies to provide any level of coverage for mental health care. While some insurance companies provided this coverage before the ACA, the new requirement for mental health services should have served to expand access to mental health care to everyone with health insurance. People who had health insurance lacking this coverage before the ACA may have been able to access physical health care and were therefore able to tend to their physical health, but may not have been able to access mental health services, creating a disparity between their physical and mental health status. This scenario would complicate the comparison of physical and mental health prior to the implementation of the ACA, creating a group of people who were technically insured, but who were still, essentially, uninsured in terms of mental health care. It is also possible that increasing access to health care, both physical and mental, made people more aware of their health and more likely to recognize and report physically and mentally unhealthy days.

## Study Limitations

This study had multiple limitations that may have impacted the results of the analyses. The first limitation is the appropriateness of the measures used. Population density assumes that a given state’s population is evenly spread over the entire area of the state. Mean population density for a state does not reflect differences in population density among regions within a state. For example, the United States Census lists Alaska’s population per square mile as 1.2 (Census Bureau, 2019a); yet Anchorage’s population density is more than 146 times greater, at 171.2 people per square mile (Census Bureau, 2019b). Using the mean population density of a state may have masked effects of population density on mental health.

Individuals moving between states may decrease the power to detect significant results. Medicaid is administered by states, so a individual’s Medicaid coverage ends when they move out of a specific state; they must reapply for Medicaid in their new state after they are physically residing in their new state. Therefore, an individual moving between expansion states is likely to have a lapse in coverage. If a person who was eligible for Medicaid in an expansion state moved to a non-expansion state, they may lose access to care if they do not meet eligibility requirements in their new state. In the future, a study that controlled for the fluidity of the American population would have more power to detect if and how the ACA affected mental health on a population level.

Another limitation involves the time between implementation of the ACA and data collection. Since the ACA was passed, numerous legal challenges and changes to the ACA have occurred; in addition, states have interpreted and implemented the law differently. The ACA may not yet have been in place long enough, with consistent implementations by federal, state, and county governments, to observe any effects on mental health.

## Conclusion

In conclusion, individuals in states with state-run insurance marketplaces had fewer PMHD than individuals in states with federally-run marketplaces, possibly due to technical issues with the federally-run marketplace that delayed implementation. PMHD did not differ significantly between states with or without Medicaid expansion, perhaps due to factors other than insurance, such as lack of providers or transportation to services or the lack of a strict, clinical measure of mental health outcomes. However, this study had several limitations, thus additional studies need to be done to assess the possible effects of the ACA on mental health.

* + - * 1. State Classifications

Following the implementation of the Affordable Care Act, states decided independently whether or not to expand Medicaid. They were also able to choose the type of insurance marketplace for purchasing insurance plans. Listed in this appendix are states’ expansion status as of December 31, 2015 and type of marketplace. There are four possible classifications for insurance marketplace: state-run; state-based with federal platform; state-partnership marketplace; and federal marketplace. All marketplace types except state-run marketplaces rely on federally managed technology. For analysis, only states with state-run marketplaces were considered to have “state marketplaces;” all other states were considered to have federal marketplaces.

|  |  |  |
| --- | --- | --- |
| **State** | **Expansion Status** | **Marketplace Type** |
| **Alabama** | Non-Expansion | Federal Marketplace |
| **Alaska** | Expansion | Federal Marketplace |
| **Arizona** | Expansion | Federal Marketplace |
| **Arkansas** | Expansion | State-Based with Federal Platform |
| **California** | Expansion | State-Run Marketplace |
| **Colorado** | Expansion | State-Run Marketplace |
| **Connecticut** | Expansion | State-Run Marketplace |
| **Delaware** | Expansion | State-Partnership Marketplace |
| **District of Columbia** | Expansion | State-Run Marketplace |
| **Florida** | Non-Expansion | Federal Marketplace |
| **Georgia** | Non-Expansion | Federal Marketplace |
| **Hawaii** | Expansion | Federal Marketplace |
| **Idaho** | Non-Expansion | State-Run Marketplace |
| **Illinois** | Expansion | State-Partnership Marketplace |
| **Indiana** | Expansion | Federal Marketplace |
| **Iowa** | Expansion | State-Partnership Marketplace |
| **Kansas** | Non-Expansion | Federal Marketplace |
| **Kentucky** | Expansion | State-Based with Federal Platform |
| **Louisiana** | Non-Expansion | Federal Marketplace |
| **Maine** | Non-Expansion | Federal Marketplace |
| **Maryland** | Expansion | State-Run Marketplace |
| **Massachusetts** | Expansion | State-Run Marketplace |
| **Michigan** | Expansion | State-Partnership Marketplace |
| **Minnesota** | Expansion | State-Run Marketplace |
| **Mississippi** | Non-Expansion | Federal Marketplace |
| **Missouri** | Non-Expansion | Federal Marketplace |
| **Montana** | Non-Expansion | Federal Marketplace |
| **Nebraska** | Non-Expansion | Federal Marketplace |
| **Nevada** | Non-Expansion | State-Based with Federal Platform |
| **New Hampshire** | Expansion | State-Partnership Marketplace |
| **New Jersey** | Expansion | Federal Marketplace |
| **New Mexico** | Expansion | State-Based with Federal Platform |
| **New York** | Expansion | State-Run Marketplace |
| **North Carolina** | Non-Expansion | Federal Marketplace |
| **North Dakota** | Expansion | Federal Marketplace |
| **Ohio** | Expansion | Federal Marketplace |
| **Oklahoma** | Non-Expansion | Federal Marketplace |
| **Oregon** | Expansion | State-Based with Federal Platform |
| **Pennsylvania** | Expansion | Federal Marketplace |
| **Rhode Island** | Expansion | State-Run Marketplace |
| **South Carolina** | Non-Expansion | Federal Marketplace |
| **South Dakota** | Non-Expansion | Federal Marketplace |
| **Tennessee** | Non-Expansion | Federal Marketplace |
| **Texas** | Non-Expansion | Federal Marketplace |
| **Utah** | Non-Expansion | Federal Marketplace |
| **Vermont** | Expansion | State-Run Marketplace |
| **Virginia** | Non-Expansion | Federal Marketplace |
| **Washington** | Expansion | State-Run Marketplace |
| **West Virginia** | Expansion | State-Partnership Marketplace |
| **Wisconsin** | Non-Expansion | Federal Marketplace |
| **Wyoming** | Non-Expansion | Federal Marketplace |

* + - * 1. States Excluded From Physical and Mental Health Comparison

The following table includes the mean poor mental health days and mean poor physical health days per month for the four states excluded from analysis of the relationship between physical and mental health. All of these states were expansion states. Of particular note, New Mexico had a drastic decrease in poor physical health from 2011 to 2015, followed by a drastic increase in 2018. It is unclear why there was this difference.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **State** | **Poor Mental Health Days**  **2011** | **Poor Physical Health Days**  **2011** | **Poor Mental Health Days**  **2015** | **Poor Physical Health Days**  **2015** | **Poor Mental Health Days**  **2018** | **Poor Physical Health Days**  **2018** |
| **New Mexico** | 3.52 | 3.31 | 3.62 | 1.51 | 3.67 | 4.28 |
| **Oregon** | 3.35 | 4.95 | 3.30 | 3.73 | 3.91 | 3.65 |
| **Kentucky** | 4.57 | 2.86 | 4.59 | 5.15 | 4.10 | 4.51 |
| **West Virginia** | 3.14 | 3.57 | 4.37 | 4.86 | 5.00 | 4.69 |

When these states were included in the analysis, the correlation between poor physical health days and poor mental health days for expansion states in 2011 was 0.27 (compared to 0.35 with these states excluded). The correlation between poor physical health days and poor mental health days for expansion states in 2015 was 0.71 (compared to 0.89 with these states excluded). correlation between poor physical health days and poor mental health days for expansion states in 2018 was 0.86 (compared to 0.80 with these states excluded).

# Bibliography

The Assistant Secretary for Planning and Evaluation. (2016). Affordable Care Act Has Led to Historic, Widespread Increase in Health Insurance Coverage (pp. 2, 10-12). Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation. Retrieved November 29, 2018 from https://aspe.hhs.gov/system/files/pdf/207946/ACAHistoricIncreaseCoverage.pdf.

The Assistant Secretary for Planning and Evaluation. (2014). Health Insurance Marketplace: Summary Enrollment Report for the Initial Annual Open Enrollment Period (pp. 9, 13-15, 27). Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation. Retrieved November 29, 2018 from <https://aspe.hhs.gov/system/files/pdf/76876/ib_2014Apr_enrollment.pdf>.

Bronson, J., & Berzofsky, M. (2017). *Indicators of Mental Health Problems Reported by Prisoners and Jail Inmates, 2011-12* (Special Report No. NCJ 250612). U.S. Department of Justice. Retrieved March 20, 2019 from [www.bjs.gov/content/pub/pdf/imhprpji1112.pdf](http://www.bjs.gov/content/pub/pdf/imhprpji1112.pdf)

Bulloch, A. G., Williams, J. V., Lavorato, D. H., & Patten, S. B. (2009). The relationship between major depression and marital disruption is bidirectional. *Depression and Anxiety*, *26*(12), 1172–1177. https://doi.org/10.1002/da.20618

Bureau of Justice Statistics. (n.d.). Bureau of Justice Statistics (Bjs) - faq detail. Retrieved March 25, 2019, from https://www.bjs.gov/index.cfm?ty=qa&iid=322Census Bureau. (2018). State Area Measurements and Internal Point Coordinates - Geography - U.S. Census Bureau. Retrieved from <https://www.census.gov/geo/reference/state-area.html>

Burns, M. E., & Wolfe, B. L. (2016). The Effects of the Affordable Care Act Adult Dependent Coverage Expansion on Mental Health. *The journal of mental health policy and economics*, *19*(1), 3–20.

Census Bureau. (2019). U.S. Census Bureau QuickFacts: Alaska. Retrieved March 25, 2019 from https://www.census.gov/quickfacts/ak

Census Bureau. (2019). U.S. Census Bureau QuickFacts: Anchorage Municipality, Alaska (County). Retrieved March 25, 2019 from https://www.census.gov/quickfacts/anchoragemunicipalityalaskacounty

Centers for Disease Control and Prevention. (2014). About BRFSS. Retrieved from: CDC - About BRFSS. (2018). Retrieved October 31, 2018 from https://www.cdc.gov/brfss/about/index.htm

Centers for Disease Control and Prevention. (2018). Stats of the States - Infant Mortality. Retrieved November 28, 2018 from https://www.cdc.gov/nchs/pressroom/sosmap/infant\_mortality\_rates/infant\_mortality.htm

Central Intelligence Agency. (2018). The World Factbook — GDP – Per Capita (PPP). Retrieved November 28, 2018 from <https://www.cia.gov/library/publications/the-world-factbook/rankorder/2004rank.html>.

Central Intelligence Agency. (2018). The World Factbook — Infant Mortality Rate. Retrieved November 28, 2018 from https://www.cia.gov/library/publications/the-world-factbook/rankorder/2091rank.html

Centers for Medicare and Medicaid Services. (2018). HEALTH INSURANCE EXCHANGES 2018 OPEN ENROLLMENT PERIOD FINAL REPORT | CMS. Retrieved November 29, 2018 from https://www.cms.gov/newsroom/fact-sheets/health-insurance-exchanges-2018-open-enrollment-period-final-report

Delaney, K. (2017). Psychiatric Mental Health Nursing Advanced Practice Workforce: Capacity to Address Shortages of Mental Health Professionals. Psychiatric Services, 68(9), 952-954. doi: 10.1176/appi.ps.201600405Fry, C., & Sommers, B. (2018). Effect of Medicaid Expansion on Health Insurance Coverage and Access to Care Among Adults With Depression. Psychiatric Services, appi.ps.2018001. doi: 10.1176/appi.ps.201800181

Han, B., Gfroerer, J., Kuramoto, S., Ali, M., Woodward, A., & Teich, J. (2015). Medicaid Expansion Under the Affordable Care Act: Potential Changes in Receipt of Mental Health Treatment Among Low-Income Nonelderly Adults With Serious Mental Illness. American Journal of Public Health, 105(10), 1982-1989. doi: 10.2105/ajph.2014.302521

HealthCare.gov. (2018). The Marketplace in your state. Retrieved November 25, 2018 from https://www.healthcare.gov/marketplace-in-your-state/

Hudson, C. (2005). Socioeconomic Status and Mental Illness: Tests of the Social Causation and Selection Hypotheses. American Journal of Orthopsychiatry, 75(1), 3-18. doi: 10.1037/0002-9432.75.1.3

Idaho Secretary of State Office. (2018). 2018 UNOFFICIAL General Election Night Results. Retrieved November 9, 2018, from https://sos.idaho.gov/elect/results/2018/General/ENR/measure\_totals.html

Initiative Measure 427. (2018). Retrieved November 9, 2018, from <https://votesmart.org/elections/ballot-measure/2419/initiative-measure-427#.W-TjNPZFzOk>

Institute of Medicine (U.S.) (Ed.). (2002). *Care without coverage: too little, too late*. Washington, D.C: National Academy Press.Jones, J., Ali, M., Mutter, R., Mosher Henke, R., Gokhale, M., Marder, W., & Mark, T. (2017). Factors that Affect Choice of Mental Health Provider and Receipt of Outpatient Mental Health Treatment. The Journal of Behavioral Health Services & Research. doi: 10.1007/s11414-017-9575-6

Kaiser Family Foundation. (2018). Explaining Health Care Reform: Questions About Health Insurance Subsidies. Retrieved November 29, 2018 from https://www.kff.org/health-reform/issue-brief/explaining-health-care-reform-questions-about-health/

Kaiser Family Foundation. (2018). Status of State Action on the Medicaid Expansion Decision. Retrieved October 10, 2019 from <https://www.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. (2019). State Decisions on Health Insurance Marketplaces and Medicaid Expansion. Retrieved March 25,2019 from https://www.kff.org/health-reform/state-indicator/state-decisions-for-creating-health-insurance-exchanges-and-expanding-medicaid/?currentTimeframe=0&sortModel=%7B%22colId%22:%22Location%22,%22sort%22:%22asc%22%7D#note-5Kessler, R., Heeringa, S., Lakoma, M., Petukhova, M., Rupp, A., & Schoenbaum, M. et al. (2008). Individual and Societal Effects of Mental Disorders on Earnings in the United States: Results from the National Comorbidity Survey Replication. American Journal of Psychiatry, 165(6), 703-711. doi: 10.1176/appi.ajp.2008.08010126

Nebraska Secretary of State Office. (2018). Nebraska Secretary of State - Election Night Results - November 6th, 2018. Retrieved November 9, 2018, from <https://electionresults.sos.ne.gov/resultsSW.aspx?text=Race&type=SW&map=CTY>Obama, B. (2016). United States Health Care Reform. JAMA, 316(5), 525. doi: 10.1001/jama.2016.9797

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

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

Patient Protection and Affordability Act (2010).

Reingle Gonzalez, J., & Connell, N. (2014). Mental Health of Prisoners: Identifying Barriers to Mental Health Treatment and Medication Continuity. American Journal of Public Health, 104(12), 2328-2333. doi: 10.2105/ajph.2014.302043

Rhubart, D. (2018). Disparities in individual health behaviors between medicaid expanding and non-expanding states in the U.S. SSM - Population Health, 6, 36-43. doi: 10.1016/j.ssmph.2018.08.005

Saloner, B., Bandara, S., Bachhuber, M., & Barry, C. L. (2017). Insurance coverage and treatment use under the affordable care act among adults with mental and substance use disorders. *Psychiatric Services*, *68*(6), 542–548. <https://doi.org/10.1176/appi.ps.201600182> Simon, G., Von Korff, M., Saunders, K., Miglioretti, D., Crane, P., van Belle, G., & Kessler, R. (2006). Association Between Obesity and Psychiatric Disorders in the US Adult Population. Archives of General Psychiatry, 63(7), 824. doi: 10.1001/archpsyc.63.7.824

Substance Abuse and Mental Health Services Administration. (2017). Key substance use and mental health indicators in the United States: Results from the 2016 National Survey on Drug Use and Health (HHS Publication No. SMA 17-5044, NSDUH Series H-52). Rockville, MD: Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration. Retrieved October 25, 2018 from https://www.samhsa.gov/data/sites/default/files/NSDUH-FFR1-2016/NSDUH-FFR1-2016.htm#mi

Tobacco and Smoking | NAMI: National Alliance on Mental Illness. (2018). Retrieved September 24, 2018, from <https://www.nami.org/Learn-More/Mental-Health-Public-Policy/Tobacco-and-Smoking>

U.S. Department of Labor. (2016, February 10). Young adults and the affordable care act: protecting young adults and eliminating burdens on businesses and families faqs. Retrieved April 15, 2019, from United States Department of Labor website: https://www.dol.gov/agencies/ebsa/about-ebsa/our-activities/resource-center/faqs/young-adult-and-aca

Wilper, A. P., Woolhandler, S., Lasser, K. E., McCormick, D., Bor, D. H., & Himmelstein, D. U. (2009). Health Insurance and Mortality in US Adults. American Journal of Public Health, 99(12), 2289–2295. <http://doi.org/10.2105/AJPH.2008.157685>

Winkelman, T. N. A., & Chang, V. W. (2018). Medicaid expansion, mental health, and access to care among childless adults with and without chronic conditions. *Journal of General Internal Medicine*, *33*(3), 376–383. https://doi.org/10.1007/s11606-017-4217-5

Xu, J., Murphy, S., Kochanek, K., Bastian, B., & Arias, E. (2018). Deaths: Final Data for 2016 (pp. 1-10). Hyattsville, MD: Centers for Disease Control and Prevention. Retrieved from https://www.cdc.gov/nchs/data/nvsr/nvsr67/nvsr67\_05.pdf