HEALTH CARE FOR COMMON MENTAL ILLNESSES: THE IMPACT OF NATIONAL INSURANCE REFORMS ON UTILIZATION AND SPENDING AND A STUDY OF SERVICES PROVIDED IN GENERAL MEDICAL SETTINGS

by
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Abstract

Depression and anxiety affect more Americans than any other mental illness. Although effective treatments are available, treatment is often inadequate, delayed, or absent altogether. Individuals with depression or anxiety and groups at risk of developing these problems face a range of barriers to appropriate treatment, including difficulties obtaining health insurance, limitations in coverage for mental health services, and challenges accessing specialized care relative to general medical care. Recent policies aimed to improve access to mental health care by expanding insurance coverage, improving fairness in insurance benefits, and strengthening services in general medical settings.

The objectives of this dissertation were to examine: 1) the impact of insurance expansion on mental health care among individuals with depression and anxiety, including changes that may signal adverse selection; 2) the association between insurance benefits reform and mental health care among individuals with depression and anxiety; and 3) the correlates of depression care and the role of screening in diagnosis and treatment among outpatient primary care visits.

The first study estimated changes in the probability and quantity of mental health service use and total and out-of-pocket spending among young adults and a separate sample of new enrollees after the dependent coverage provision (DCP) of the Affordable Care Act was implemented. The DCP was associated with increased service use and spending without higher intensity service use by new enrollees, suggesting those who gained coverage needed treatment but not at higher levels.

The second study estimated changes in the probability and quantity of mental health service use and total and out-of-pocket spending among young adults after the Mental Health Parity and Addiction Equity Act (MHPAEA) was implemented. The MHPAEA was associated with small shifts in service use without increased financial protection, suggesting modest changes in this population that were attributable to the policy.

The third study assessed the correlates of depression screening, diagnosis, and treatment in representative primary care settings and estimated the relationship between screening rates and the probability of diagnosis and treatment. Patterns of depression care suggested that physicians focused on high-risk patients. Additionally, higher screening rates were associated with higher rates of depression identification and treatment.

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CHAPTER ONE: INTRODUCTION

Rationale for Research

Background

Depression and anxiety are the most common mental disorders affecting Americans. In a given year, more than one in five adults will experience any anxiety disorder and about one in ten will experience depression [1]. Over their lifetimes, more than one third of adults will experience any anxiety disorder and about one in five will experience depression [1]. In addition, a large proportion of people experience depression and anxiety disorders simultaneously [2, 3]. Effective treatments are available to address these high prevalence rates, yet many individuals with depression or anxiety are untreated [4].

People who ultimately receive treatment for depression and anxiety often experience long delays between the onset of their symptoms and initial contact with mental health care [5]. Furthermore, individuals who develop depression and anxiety at younger ages are less likely to make treatment contact in their lifetime than those who develop a disorder later, possibly because barriers to care are exacerbated among young people and alternative coping mechanisms inhibit future treatment seeking [5]. The association between early onset and low treatment rates is particularly important considering both depression and anxiety typically emerge early in the life course and often recur, which can lead to persistent negative outcomes [6].

At the population level, depression and anxiety disorders are the leading contributors to mental health and substance use-related morbidity [7]. Depression and anxiety disorders are also associated with increased mortality, although most people die from the same physical causes as people without mental illness [8]. This disparity in the risk of death between individuals with and without mental illnesses can be explained by clinical, health system, and socioeconomic factors combined, but health status has the largest effect [9].

From a public health perspective, this finding highlights the importance of health system factors, including insurance coverage and access to care [9].

Expanding Access to Commercial Health Insurance Coverage

Young adulthood is a vulnerable period not only for developing depression and anxiety, but also for experiencing insurance problems [6, 10]. Over 40% of young adults 19-25 years old reported any prior-year uninsurance in 2010, the year the Affordable Care Act (ACA) was enacted [11]. Despite conceptions that young adults forgo health insurance out of a belief they do not need coverage, evidence shows that most young adults with access to insurance through an employer or family member enroll in coverage when it is affordable [12, 13]. By allowing young adults to maintain insurance through a parental plan until they turn 26 years old, the ACA's dependent coverage provision (DCP) expanded access to private health insurance. At that time, insurers commonly restricted coverage for dependents through age 18 or upon graduation from high school or college for full-time students [14]. While some states had passed laws extending coverage to older dependents, many insurers were exempt from state regulations and most laws included at least one exclusion based on marital status, residency outside the parent's home, or having their own children [14]. Beginning September 23, 2010, the DCP required private plans to insure dependents regardless of these other factors.

Many young adults gained private insurance coverage through this mechanism [15-21]. As a result of higher coverage rates, studies also indicated young adults experienced increased access to care. Young adults were less likely to report delaying care and more likely to report having a routine check-up following the provision than before it was implemented [16, 21]. Direct measures of young adults' health care found increases in health service utilization, particularly in inpatient and emergency settings [15, 17]; however, results for mental health and substance use services were mixed, with some studies finding increases in hospital-based care and others finding decreases [15, 18, 19, 22, 23]. Published research to date has not studied the privately insured young adult population, a critical group for understanding the relationship between dependent coverage expansion and changes in the pool of enrollees. Increased access to private coverage could have led to adverse selection whereby young adults who needed mental health services took advantage of the new option at higher rates than young adults without mental illness. Early research explored possible selection effects by examining the relationship between self-reported health and insurance coverage but the results differed [16, 24]. One study found larger initial gains in insurance coverage among those reporting worse health, while the other found no differences in coverage by health status [16, 24]. Neither study explicitly considered mental health.

The first manuscript assessed how mental health service use and spending among privately insured young adults diagnosed with depression and anxiety changed after implementation of the DCP. First, the overall impact of the DCP on outcomes among young adults was analyzed. Then, outcomes among newly enrolled young adults were analyzed to assess whether those who first gained access to insurance after the policy demonstrated patterns of mental health service use that were consistent with the level of services utilized by new enrollees in insurance plans and to evaluate these utilization and spending patterns in relation to changes observed in the overall sample. This approach was aimed at understanding whether changes among the broader group reflected new access to insurance coverage or whether young adults who gained coverage after the policy received treatment at higher rates and for more chronic or serious problems relative to all new enrollees, a change in the composition of the insured populations that could be indicative of selection. The results from both analyses have important implications regarding the distribution of financial risk associated with mental health care and future efforts aimed at improving access to care for young adults.

Improving Equity in Health Insurance Benefit Design

Health coverage alone does not ensure access to care. In fact, many young adults with insurance are underinsured, reporting that needed treatment was delayed or missed altogether because of costs [12]. In one study of the correlates of mental health care utilization among a sample young adults who perceived a need for mental health treatment, service use was associated with membership in a family with more financial resources despite the fact that nearly all young adults studied were covered by health insurance [25]. These results indicate that out-of-pocket costs can present barriers to mental health care among insured young adults, particularly with respect to their wider financial considerations.

In the past, cost sharing was often set at higher rates for mental health than medical services. Mental health benefits were more restrictive than medical benefits in other ways, for example, in terms of the limits placed on the number of services covered in a given time period. Before the proliferation of managed care techniques to contain costs, insurers justified applying more restrictive measures to mental health benefits because mental health care utilization was shown to be more responsive to price [26]. By increasing the effective cost of mental health services paid by beneficiaries, insurers could control the total costs accrued for mental health care. Managed care techniques can also contain costs, and studies showed that implementing parity between mental health and medical/surgical benefits in plans with managed behavioral health care could achieve improvements in financial protection for beneficiaries without considerable spending increases overall, substantially weakening the rationale for disproportionate mental and medical/surgical benefit structures based on total spending [27].

After decades of research and advocacy, the Mental Health Parity and Addiction Equity Act (MHPAEA) of 2008 was passed in order to ameliorate inequities in insurance design. The MHPAEA required large group insurance plans that offered mental health coverage to provide mental health and substance abuse benefits equivalent to medical and surgical benefits [28]. The MHPAEA improved upon the previous Mental Health Parity Act, a 1996 law prohibiting discrimination in spending limits, by encompassing substance abuse services in addition to mental health care and by extending parity requirements to cost sharing provisions, treatment limits, benefits for services from participating providers and out-of-network care, and other nonquantitative care management practices [29]. Studies have identified associations between implementation of the MHPAEA and reductions in cost-sharing requirements and annual limits for mental health services [30-33]. Evidence has also shown an association between implementation of the MHPAEA and improvements in access to care and financial protection for enrollees, with most studies showing increased mental health service use without increased out-of-pocket spending [34-37]. No existing studies of the MHPAEA focused on depression or anxiety disorders; however, analyses of parity implemented in health plans for federal employees show promising results among individuals with depression, separately finding decreases in out-of-pocket spending with steady service utilization and some improvements in guideline-concordant depression treatment [38, 39]. Research has not specifically examined the impact of the MHPAEA among young adults who have elevated risk of mental illness and insurance problems.

To address this gap, the second manuscript analyzed the association between implementation of the parity law and mental health service use and spending among young adults with depression and anxiety diagnoses. Utilization and spending for inpatient and outpatient mental health services were measured to assess whether the benefits of the federal parity law extended to a high-risk group of individuals who have common mental illnesses.

Screening, Diagnosis and Treatment for Depression in Primary Care Settings

By design, primary care is the main entry into the health system [40]. Consequently, general medical providers rather than specialty mental health providers encounter and care for many patients with depression and other mental illnesses [41, 42]. Although effective psychological and pharmacological options are available to reduce symptoms and promote remission in primary care settings, most primary care patients with depression receive no treatment at all [4, 41, 43]. Lack of treatment can largely be explained by low rates of depression identification in primary care settings [43]. When depression is diagnosed and treated, psychotherapy and medication management often fail to meet evidence-based guidelines [41].

Coordinated and collaborative care interventions have demonstrated success integrating higher quality depression care into general medical settings, but important challenges remain [44]. From a research perspective, the relative effect of specific intervention components within comprehensive programs is difficult to isolate and mixed research results from program evaluations highlight the potential importance of contextual influences, including the organizational environment in which the program is implemented [44]. From a practical perspective, integrating mental health treatment into primary care is limited by financial barriers and other resource constraints, such as mental health workforce shortages [44-47]. Considering most primary care settings are practices with only one physician or physicians in small group practices, a better understanding of care patterns across contexts is needed to distinguish the elements of depression treatment that are feasible to implement and likely to succeed in conventional settings [48, 49].

Systematic evidence reviews have established the basis for recommendations and policy incentives to screen adolescents and adults for depression in general medical settings [50, 51]; however, critics of the recommendations have questioned the quality of the evidence, the applicability to typical settings, and the ultimate tradeoffs associated with universal depression screening programs [52-56]. In practice, depression screening in primary care settings is rare, despite physicians' reporting uncertainty about diagnosing depression and acknowledging that screening is helpful [51, 57-59]. These apparent discrepancies highlight that evidence is lacking about the role of screening in the pathway to depression diagnosis and treatment in representative outpatient settings.

The third manuscript examined the correlates of depression screening, diagnosis, and treatment in representative primary care settings to characterize patterns of care. A separate analysis considered the potential implications of higher screening rates for depression diagnosis and treatment outcomes, using a simulation approach to examine how higher screening might affect these outcomes. Given the recent acceleration toward new and evolving delivery and payment systems that emphasize primary care, identifying key features of clinical encounters between patients and providers can help inform the evidence base to strengthen depression care in primary care settings, including potentially increasing diagnosis and treatment rates.

Study Aims

This research was motivated by recent policy efforts to improve access to higher quality mental health care. The broad objective was to examine mental health services in the context of three dimensions of access to care [60]. First, health policy that expands the availability and affordability of insurance can enhance potential access to care through financial protection against treatment costs. Second, insurance reform that explicitly addresses the needs of vulnerable, stigmatized, and disadvantaged groups can improve equitable access to care. Finally, the relationships between health services and individual and contextual characteristics can reveal patterns to explain differences in realized access to care, or service use. The first two studies focused on young adults, who have increased risk of experiencing mental health and insurance problems. The third study focused on general medical settings, where mental health care is common but inadequate.

Aim 1 – Examine the impact of the dependent coverage provision (DCP) of the Affordable Care Act on mental health service use and spending among young adults diagnosed with depression and anxiety, including changes in the composition of the population in treatment that may indicate selection effects

Aim 2 – Examine the association between the Mental Health Parity and Addiction Equity Act (MHPAEA) and mental health service use and spending among young adults diagnosed with depression and anxiety

Aim 3 – Examine the correlates of depression care and the role of screening in depression diagnosis and treatment among visits by adolescents and adults to outpatient primary care settings

Dissertation Organization

The dissertation is organized into three empirical chapters with tables and figures incorporated and a concluding chapter. Chapter Two presents a study of the impact of dependent coverage expansion on mental health service use and spending among young adults with depression and anxiety diagnoses compared to older young adults who were not targeted by the ACA provision, including whether service use and spending were indicative of adverse selection. Chapter Three examines the association between the federal parity law and mental health service use and spending among young adults with depression and anxiety diagnoses. Chapter Four describes the role of depression screening in diagnosis and treatment among visits to outpatient primary care settings by adolescents and adults. Chapter Five reviews and discusses the findings and the implications for policy and future research. Appendices include tables and figures from supplemental analyses.

CHAPTER TWO: MANUSCRIPT ONE

The impact of the dependent coverage provision of the Affordable Care Act on mental health service use and spending among young adults with depression and anxiety

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Abstract

Objective: The purpose of this study was to examine the impact of the dependent coverage provision (DCP) of the Affordable Care Act (ACA) on mental health service use and spending among young adults, including changes potentially induced by shifts in the young adult insurance pool. Service use and spending were assessed among young adults covered by private health insurance who had depression and anxiety diagnoses.

Methods: Insurance claims were extracted from the MarketScan database, which included enrollees in large employer-sponsored plans before (2007-2009) and after (2011-2012) implementation of the DCP. Difference-in-difference models assessed the impact of the DCP, comparing changes over time between young adults 19-25 years old and adults 27-33 years old who were not targeted by the policy. To test changes in the pool of privately insured young adults, a separate sample of new enrollees was analyzed, defined as individuals within the same age groups who were in their first year of continuous enrollment in a plan. Outcomes were depression and anxiety-related inpatient and outpatient services, outpatient psychotherapy and medication management, and total and out-of-pocket mental health spending.

Results: Implementation of the DCP was associated with increases in the probability of young adults using all inpatient and outpatient services, the number of outpatient depression or anxiety and psychotherapy services used, and total and out-of-pocket spending relative to the comparison group of 27-33 year old adults not eligible for coverage under the DCP. New enrollees showed similar increases in the probability of using services and spending, but fewer increases in the number of services used relative to changes in the overall sample.

Conclusions: Increases in mental health service use among young adults with depression and anxiety diagnoses suggest the DCP was associated with increased access to care among

those enrolled in large employer-sponsored insurance plans. Young adults who enrolled in insurance after implementation may have had previously unmet treatment needs or disproportionately higher rates of depression and anxiety, but they showed similar treatment intensity as young adults with private coverage before the policy was implemented.

Introduction

Depression and anxiety disorders are the most common mental health problems experienced by Americans [1]. Effective treatments that reduce symptoms and promote remission are available, but many people with a disorder remain untreated [4, 5]. Recent insurance reform efforts were aimed at addressing under-treatment of health problems, including common mental illnesses like depression and anxiety. Policies that expand insurance coverage to high-risk groups have the potential to improve treatment rates.

The Affordable Care Act (ACA) included a provision aimed at improving insurance coverage for young adults. Young adulthood is a period not only associated with high rates of uninsurance, but also a time when depression and anxiety tend to emerge [11, 61]. The ACA's dependent coverage provision (DCP), implemented in September 2010, required insurers to extend coverage up to age 26 on any parental plan offering dependent coverage. Furthermore, the DCP applied regardless of student status, marital status, residency outside the parent's home, or having children—conditions which were previously used to restrict dependent coverage [6, 14]. Early evidence demonstrated that many young adults gained private coverage through this mechanism, including one analysis indicating that individuals with worse self-reported health experienced larger coverage gains initially [16, 21, 62-66].

Early studies also showed improvements in access to care associated with the policy [15-21]. Some research detected general increases in the likelihood of receiving any mental health treatment as a result of the policy [23]. Other research detected specific increases in the probability of using hospital-based services, including inpatient treatment for mental health problems such as depression and psychosis [15, 19]; however, results were mixed for emergency settings [19, 22]. Research examining changes in the intensity of mental health care found no changes in the length of stay or number of procedures performed in inpatient settings as a result of the policy, but consistently found increases in the share of expenditures covered by private insurers [15, 19, 22]. Increases in hospital-based services could reflect increased access to inpatient care directly or indirectly through increased access to outpatient services that identify individuals who could benefit from inpatient treatment [19]. To date, patterns of mental health service use and spending have not been examined in relation to outpatient mental health care. The purpose of this study was to examine the effect of the DCP on mental health service use and spending across treatment settings within the privately insured young adult population.

Studying the DCP in this group has additional implications since the coverage mandate may have drawn individuals who have greater mental health treatment needs to private insurance plans [67]. Eventually, the DCP could help ensure uninterrupted coverage during a period when risk of uninsurance is high; however, its implementation initially presented a new coverage option for young adults without insurance. As a result, a larger proportion of the privately insured young adult population was newly covered following implementation [66]. Changes in service utilization after implementation could arise through two mechanisms. First, newly insured young adults could have unmet need for mental health treatment since uninsured individuals are both more likely to need mental health care and less likely to receive care than covered individuals [68]. Second, adverse selection could have led those with mental health treatment needs or more serious or chronic mental health problems to take advantage of the DCP disproportionately to healthy young adults. This study explored both of these possibilities.

In addition to examining the effect of the DCP on inpatient and outpatient mental health service use and total and out-of-pocket spending among privately insured young adults with depression and anxiety diagnoses, an analysis of only new enrollees aimed to understand changes within the pool of covered young adults, including whether selection into plans changed after the DCP. Among the full group of young adults ages 19 to 25 with depression and anxiety diagnoses, it was hypothesized that the DCP led to increases in: 1) the probability of using inpatient and outpatient mental health services, 2) the quantity of outpatient mental health services used, and 3) total and out-of-pocket spending on mental health care. If increases in mental health service use and spending were related to gaining access to insurance, young adults who newly enrolled in insurance after the DCP was implemented might have similar utilization to new enrollees before the policy; however, if increases in mental health service use and spending were related to adverse selection into plans by individuals with mental health treatment needs or greater levels of need, young adults who newly enrolled in insurance after the DCP was implemented might have higher utilization than new enrollees before the policy. Among the newly enrolled group of young adults ages 19-25 with depression and anxiety diagnoses, it was hypothesized that the DCP led to increases in all utilization and spending outcomes.

Methods

Data

Data were drawn from the Truven Health MarketScan® Commercial Claims and Encounters database, which includes inpatient, outpatient, and pharmaceutical claims for individuals insured by large, employer-sponsored plans. These data are longitudinal at the individual level, allowing service utilization and costs to be calculated for each enrollee over time. The pre-policy period included data from 2007-2009, and the post-policy period included data from 2011-2012. Data from 2010 were excluded because it was largely a transition year in which some insurers implemented dependent coverage requirements early and others implemented in September with changes effective at the start of the 2011 plan year [69].

Sample

The treatment group included young adults 19-25 years old who were targeted by the policy. Because the policy was national in scope, the comparison group included older young adults 27-33 years old who were likely to have similar health care needs but were not eligible for dependent coverage under the ACA due to their age. Similar to prior research, individuals who were 26 years old were excluded from analyses because they might have been covered under the provision during part of the year in which they turned 26, complicating their group assignment for the calendar year [15]. All enrollees meeting criteria for age and continuous calendar year enrollment were included in analyses of the probability of service use.

Analyses of the quantity of service use and mental health spending were limited to young adults with depression and anxiety diagnoses, defined by the presence of at least one inpatient or outpatient claim with a relevant diagnosis in the calendar year in which they met criteria for age and continuous enrollment described above. International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes used to categorize depression diagnoses were 296.2, 296.3, 300.4, and 311 and anxiety diagnoses were 300.0, 300.2, 300.3, 309.81, and 313.0-313.2 [70].

Outcome Measures

Using depression and anxiety diagnoses in addition to relevant procedure codes, inpatient and outpatient services were categorized to examine outcomes related to probability of service, intensity of service use, and spending. Similar to other established approaches, inpatient services were categorized as depression or anxiety-related hospitalizations if at least half of all inpatient claims associated with the hospitalization had a relevant diagnosis and the last (discharge) claim also had a relevant diagnosis [36, 71]. Outpatient services were categorized according to a relevant diagnosis or procedure code on the outpatient claim. Depression and anxiety services included outpatient claims with either a depression or anxiety diagnosis. Psychotherapy and medication management services included outpatient claims with either a Current Procedural Terminology (CPT) or Healthcare Common Procedure Coding System (HCPCS) code for psychotherapy or medication management, respectively.

The probabilities of using inpatient depression or anxiety services, outpatient depression or anxiety services, outpatient psychotherapy, and outpatient medication management in a given year were calculated among individuals who met criteria for age and continuous calendar year enrollment. Intensity of service use was calculated among individuals with depression and anxiety diagnoses who met criteria for age and continuous calendar year enrollment as the average total number of outpatient depression or anxiety services, psychotherapy services, and medication management services per person per year, conditional on using the service.

Total and out-of-pocket spending were measured among individuals with depression and anxiety diagnoses. Total and out-of-pocket spending were calculated as the average number of U.S. dollars per person per year spent on inpatient, outpatient, and prescription drug services adjusted for inflation to 2012 dollars using the Consumer Price Index. Total spending included the total amount eligible for payment to a provider before out-of-pocket payments were applied. Out-of-pocket spending included deductibles, coinsurance, and copayments.

Analyses

For each outcome, a difference-in-differences study design was used to measure the effect of implementing the DCP by comparing the change over time between the periods after and before implementation in the average value of the outcomes for the young adult treatment group compared to older young adults. Older young adult adults serve as a comparison group for outcomes expected in the absence of the DCP because older young adults were not impacted by the policy but experienced similar economic conditions. To obtain the difference-in-differences estimate, regression models included an interaction term for policy period (pre-DCP and post-DCP) and study group (treatment and comparison). In addition to the difference-in-differences interaction, all models included individual terms for the policy period and study group and covariates to adjust for age, sex, census region, and urban/rural setting.

Using Stata statistical software, logistic regressions estimated effects of the DCP on the probability of using any inpatient or outpatient depression or anxiety services and specific outpatient psychotherapy and medication management services [72]. Because service use intensity represents a count, negative binomial regressions estimated the effects of the DCP on the average annual number of outpatient services per person among individuals with depression or anxiety diagnoses who used each service. The effects of the DCP on average total and out-of-pocket spending per person were estimated separately with two-part models, first using logistic regression to estimate any non-zero spending and then using generalized linear models (GLMs) with a log transformation and a gamma distribution. Model fit was assessed using alternative linear model specifications, including ordinary least squares (OLS) regression. Spending predictions were robust to model specifications, including GLM and OLS models applied to raw and log-transformed data in addition to

GLM models assuming various distributions. Standard errors for all models were clustered at the enrollee level.

Insurance status and mental health care utilization and spending prior to enrollment in private insurance were not observable in these data. To assess whether utilization increases among young adults who benefitted from the policy were indicative of selection into insurance plans, a subgroup of enrollees in only the first calendar year they met age and enrollment criteria was analyzed separately. Increases in the probability of using mental health services could signal treatment for previously unmet needs, while higher intensity utilization of mental health services could indicate greater treatment needs among newly enrolled young adults. The new enrollee sample was identified using the same age and continuous enrollment criteria as the primary analysis.

The difference-in-difference method assumes differences between the treatment and comparison groups' mental health service use and spending in the pre-policy period would persist into the post-policy period in the absence of the DCP. Other research has specifically challenged this assumption in studies of the DCP that compare young adults to older young adults, expressing concerns that these age groups experience different economic forces [73]. One solution used in prior research examines outcomes using more narrowly defined age groups that are more likely to respond similarly to shifts in labor and health insurance markets [15, 63]. To provide confidence in the results for the full range of young adults who could have been affected by the DCP, a sensitivity analysis applied this more conservative approach by comparing young adults 23-25 years old with older young adults 27-29 years old. Focusing on narrower age ranges also excluded many college-age adults whose potential to have dependent coverage based on their student status could diminish measured effects of the DCP [14]. Studying the private insurance population allowed for an additional sensitivity analysis to compare outcomes for 19-25 year olds enrolled as dependent children with 19-25 year olds enrolled as primary beneficiaries. Sensitivity analyses were conducted for both the primary (see Appendix A) and new enrollee analyses (see Appendix B).

Results

In the pre-policy period (2007-2009), young adults 19-25 years old with depression and anxiety diagnoses (N=119,998) were continuously enrolled with a relevant diagnosis for a total of 142,196 person-years and adults 27-33 years old with depression and anxiety diagnoses (N=185,264) were continuously enrolled with a relevant diagnosis for a total of 231,801 person-years. In the post-policy period (2011-2012), young adults 19-25 years old with depression and anxiety diagnoses (N=168,880) were continuously enrolled with a relevant diagnosis for a total of 198,768 person-years and adults 27-33 years old with depression and anxiety diagnoses (N=171,632) were continuously enrolled with a relevant diagnosis for a total of 202,512 person-years. A larger proportion of young adults 19-25 years old with depression and anxiety diagnoses were child dependents in the post-policy period (N=128,584, 76.1%) than in the pre-policy period (N=66,465, 55.4%). A small minority of adults 27-33 years old with depression and anxiety diagnoses were child dependents in both the post-policy period (N=1,063, 0.6%) the pre-policy period (N=1,285, 0.7%)

Baseline demographic and clinical characteristics of enrollees with depression and anxiety diagnoses in the period before the DCP was implemented are shown in Table 2.1. For each study group in the pre-policy period, baseline demographic and clinical characteristics are averages of the first year an individual had a depression or anxiety diagnosis, met age criteria, and were continuously enrolled (Table 2.1). At baseline, both the young adult group (67.3%) and the comparison group (69.3%) were mostly female. Few enrollees in the young adult group used inpatient depression or anxiety services (2.7%), while most used outpatient depression or anxiety services (99.3%). Less than half of young adults used psychotherapy (42.8%) and a minority used medication management services (5.8%). Similarly, few enrollees in the comparison group used inpatient depression or anxiety services (1.9%), while most used outpatient depression or anxiety services (99.6%). Less than half of enrollees in the comparison group used psychotherapy (43.3%) and a minority used medication management services (6.1%). On average, the young adult group had somewhat lower intensity outpatient service use at baseline for depression or anxiety, psychotherapy, and medication management than the comparison group.

Estimated effects of the policy on service use and spending outcomes are shown in Table 2.2. Compared to adults 27-33 years old, young adults 19-25 years old were significantly more likely to use both inpatient ($p<0.001$) and outpatient ($p<0.001$) depression or anxiety services, psychotherapy ($p<0.001$), and medication management ($p<0.001$) after the DCP was implemented. These changes in the probability of service use represented increases above young adults' pre-policy rates of service use ranging from 9.2% for outpatient depression or anxiety services to 33.3% for inpatient depression or anxiety-related hospitalizations. Among individuals with depression and anxiety diagnoses, young adults had significant increases in the quantity of outpatient depression or anxiety services ($p<0.001$) and psychotherapy ($p<0.001$), but no difference in medication management ($p=0.750$) compared to adults 27-33 years old. Increases in the quantity of outpatient depression or anxiety services and psychotherapy associated with policy implementation were small, each averaging less than one additional visit per person per year. Among individuals with depression or anxiety diagnoses, young adults 19-25 years old had significant increases in total spending ($p<0.001$) and out-of-pocket spending ($p<0.001$) compared to adults 27-33 years old. Increases in spending associated with the DCP averaged $661 total and $80 out-of-pocket per person per year.

Sensitivity analyses comparing young adults 23-25 years old with adults 27-29 years old produced similar statistically significant results as the full group findings, but increases in the probability of service use were higher while increases in the quantity of services used and spending increases were lower in magnitude. Sensitivity analyses comparing young adults 19-25 years old enrolled as dependents to those enrolled as the primary beneficiary demonstrated higher increases in the probability of using inpatient and outpatient depression or anxiety services overall, but no differences either in the probability of using specific outpatient services or in the quantity of services used; spending increases were lower in magnitude than the full and narrow group findings (see Appendix A).

New Enrollees

Demographic and clinical characteristics of new enrollees with depression or anxiety in the period before DCP implementation were similar to baseline characteristics of all enrollees on average (Table 2.1). Difference-in-difference estimates for new enrollees are shown in Table 2.2. After the DCP was implemented, newly enrolled young adults 19-25 years old had significantly greater increases in the probability of using all inpatient and outpatient services compared to newly enrolled adults 27-33 years old ($p<0.001$ for all services measured). Newly enrolled young adults 19-25 years old used significantly more depression or anxiety outpatient services compared to older young adults 27-33 years old ($p<0.001$), but there were no differences between groups in the number of psychotherapy ($p=0.403$) or medication management services used ($p=0.613$). The DCP was associated with greater increases in total ($p<0.001$) and out-of-pocket spending ($p<0.001$) for newly enrolled young adults 19-25 years old compared to newly enrolled adults 27-33 years old.

Sensitivity analyses comparing narrower age ranges of newly enrolled young adults produced similar statistically significant increases in probability of service use and spending; however, there were no differences detected in the quantity of services used. Sensitivity analyses comparing newly enrolled young adult dependents with primary beneficiaries demonstrated higher magnitude increases in the probability of using inpatient and outpatient depression or anxiety services, but no differences in the number of outpatient services used. Increases in spending were similar to the full sample of new enrollees (see Appendix B). Difference-in-difference estimates from the primary analysis and new enrollee analysis, including sensitivity groups, are presented in Table 2.3.

Discussion

This study found that the DCP was associated with increases in mental health service use and spending among privately insured young adults with depression and anxiety diagnoses. Increases in the probability of using inpatient and outpatient services were consistent with previous research, which has found higher inpatient utilization for mental-health related problems and evidence suggestive of increases in outpatient mental health treatment attributable to the DCP [15, 19, 23]. In addition to higher rates of outpatient service use, some findings suggest that young adults had increased service use intensity as a result of the DCP. Generally, more intensive outpatient treatment could be explained by greater emphasis on ambulatory mental health care, which can reduce the need for hospital-based care if mental illness is identified and treated in outpatient settings [19, 74, 75]. After the DCP was implemented, higher intensity outpatient use also could have occurred if young adults who gained new coverage as a result of the policy had greater treatment needs due to more chronic or serious mental health problems.

Results from the new enrollee analyses showed more young adults accessed services but largely suggest they did not use more services per person as a result of the policy. These findings suggest that young adults who gained new insurance coverage following implementation of the DCP had higher rates of mental health service use, but treatment levels that were comparable to young adults who were being treated for depression and anxiety prior to implementation of the DCP. Studies in inpatient settings have also found that the DCP was associated with increased probability of care but not more intensive care, indicating young adults used inpatient services at higher rates but had similar levels of treatment as other inpatients [15]. Other research has shown that significant increases in mental health treatment as a result of the DCP were concentrated among young adults with possible behavioral health treatment needs, but whether increases reflected treatment for a mild or transient condition or treatment for more chronic or severe conditions is unknown [23]. Previous research is compatible with the findings presented here, but this work is the first to address changes in mental health care among the privately insured young adult population that could potentially reflect adverse selection as a result of the DCP. The results are not conclusive since previous coverage and service use remain unknown, but they provide an important perspective on changes in treatment within the insurance pool covered by large employers.

Rates of mental health service use increased significantly after the DCP was implemented. Estimates for the probability of service use ranged from 9% to 29% increases over rates in the pre-policy period among the full group of young adults and from 11% to 33% over pre-policy utilization rates among new enrollees, suggesting the DCP potentially led to higher utilization rates unrelated to newly enrolling in coverage. Although some mental health service use outcomes measuring the quantity of services used increased significantly after the DCP was implemented, estimates were relatively small. The largest estimated increase in the quantity of outpatient services used was an increase of less than one additional depression or anxiety visit per year for each user of outpatient depression or anxiety services among the full group of young adults. Other increases in the intensity of outpatient service use were smaller or not significant.

Consistent with increases in service use, the DCP was associated with higher average total and out-of-pocket spending. Estimates ranged from $494 to $678 in total spending and from $51 to $80 in out-of-pocket spending on average per person per year. Although the spending increases assumed by employer-sponsored insurers is not insignificant within the subset of privately insured young adults with depression or anxiety, increases would be much smaller when aggregated across all enrollees. The magnitude of out-of-pocket spending increases cannot be determined without information related to previous insurance coverage and service use. Modest increases could be difficult for some young adults to assume, but estimates for out-of-pocket spending increases represent a fraction of the cost of care without insurance.

The data were drawn from private employer-sponsored insurance plans, which offers an important perspective given that over half of the U.S. population was covered by employer-sponsored insurance in 2012 [76]; however, the main limitation of analyzing private insurance claims is the inability to explain increased rates of mental health service use and spending in relation to prior coverage and utilization. Another limitation of the insurance claims studied here is that the information comes from only large employers. While the dataset includes around 20 million covered lives each year, the results are not necessarily representative of all individuals covered by large group insurance. Furthermore, the results are not generalizable to the smaller subset of individuals with private insurance obtained through the individual market or small employers [77, 78]. Due to their smaller enrollee pools, individual and small group plans may be more affected by changes in utilization and spending that result from adverse selection.

Another challenge of insurance claims is the limited demographic information available, which restricts the ability to assess the comparability of treatment and comparison groups. To address the primary concerns that have been raised in relation to the appropriateness of study groups, multiple sensitivity analyses were conducted that produced similar statistically significant results and provided confidence in the overall findings of the study. Nonetheless, some potentially important characteristics that could be associated with variation in mental health care utilization were not observed and could not be controlled for in the analyses, such as race/ethnicity and socioeconomic status.

Conclusion

Findings indicate the DCP led to increased rates of mental health service use among young adults with depression and anxiety diagnoses in the first two years after full implementation, suggesting the DCP increased access to care for a high-risk population of young adults. Increased utilization rates could be explained by coverage of previously uninsured individuals, which may have a higher proportion of young adults with need for mental health treatment. Alternatively, increased utilization could result from coverage of a disproportionate share of young adults with need for mental health treatment, which may indicate adverse selection into plans. In either case, young adults who gained coverage after the DCP was implemented had similar levels of utilization as young adults who newly enrolled in insurance before implementation, which suggests the mental health problems of new enrollees were not more severe or chronic. With increased access to care, modest spending increases were observed; however, higher mental health service use and spending attributable to the DCP may be unique to this early post-policy period.

Over time, the DCP should act primarily as a means of continuous rather than new coverage, reducing the proportion of young adults that access mental health care because of unmet treatment needs. To date, published studies have assessed the impact of the DCP on mental health care utilization and spending using data from 2012 or earlier. Another ACA provision known as the individual mandate was implemented in 2014, requiring nearly all U.S. citizens to have health insurance or pay a fee when filing taxes [79]. Because the penalty for uninsurance was introduced incrementally, measures of mental health care utilization and spending may be more balanced in later years. In other words, as insurance coverage became more affordable than uninsurance, healthy young adults might be represented more proportionately in private insurance [12].

Table 2.1 Baseline characteristics of young adults with depression and anxiety diagnoses before the DCP was implemented, stratified by primary and new enrollee analyses

	Primary Analysis				**New Enrollee Analysis**			
	19-25 years old		**27-33 years old**		**19-25 years old**		**27-33 years old**	
	N	%	**N**	%	**N**	%	**N**	%
	119,998		185,264		91,091		122,778	
Sex								
Female	80,769	67.3	128,351	69.3	61,712	67.7	85,416	69.6
Census Region								
Northeast	18,675	15.6	28,551	15.4	14,775	16.2	20,204	16.5
Midwest	32,331	26.9	45,875	24.8	24,364	26.7	30,163	24.6
South	40,134	33.4	70,864	38.3	30,432	33.4	46,163	37.6
West	28,858	24.0	39,974	21.6	21,520	23.6	26,248	21.4
Urban/rural								
MSA	106,092	88.4	163,512	88.3	80,795	88.7	109,160	88.9
Diagnoses								
Depression alone	55,491	46.2	87,323	47.1	42,910	47.1	59,235	48.2
Anxiety alone	48,356	40.3	73,871	39.9	35,505	39.0	46,874	38.2
Depression and anxiety	16,151	13.5	24,070	13.0	12,676	13.9	16,669	13.6
Comorbidities								
Any mental illness	28,252	23.5	36,955	19.9	21,650	23.8	24,582	20.0
Bipolar disorder	6,852	5.7	7,963	4.3	5,584	6.1	5,781	4.7
Substance use disorder	6,834	5.7	6,169	3.3	5,238	5.8	4,203	3.4
Service use								
Any inpatient depression or anxiety service use	3,283	2.7	3,576	1.9	2,214	2.4	1,968	1.6
Any outpatient depression or anxiety service use	119,208	99.3	184,483	99.6	90,504	99.4	122,279	99.6
Average depression or anxiety services per year among users	5.83		6.14		6.14		6.64	
Any outpatient psychotherapy service use	51,394	42.8	80,209	43.3	40,783	44.8	56,413	45.9
Average psychotherapy services per year among users	8.92		9.69		9.24		10.25	
Any outpatient medication management service use	18,122	5.8	23,838	6.1	15,270	5.8	18,217	6.1
Average medication management services per year among users	3.36		3.48		3.41		3.55	
Any psychotropic medication use	82,849	69.0	131,995	71.2	62,683	68.8	87,015	70.9

Table 2.2 Estimated effects of the DCP on mental health service use and spending among young adults with depression and anxiety diagnoses

Primary Analysis	**19-25 years old**				**27-33 years old**						
	Pre-DCP		**Post-DCP**		**Pre-DCP**		**Post-DCP**				
Probability of service use	**%[b]**	**95% CI**	**%**	**95% CI**	**%**	**95% CI**	**%**	**95% CI**	**DD[a]**	**95% CI**	**p**
Inpatient or Outpatient Depression or Anxiety	6.54	6.48-6.59	8.20	8.15-8.26	7.10	7.06-7.14	8.16	8.10-8.22	0.60	0.53-0.67	<0.001
Inpatient Depression or Anxiety	0.12	0.12-0.13	0.21	0.20-0.22	0.14	0.14-0.15	0.19	0.18-0.20	0.04	0.02-0.05	<0.001
Outpatient Depression or Anxiety	6.52	6.46-6.57	8.17	8.11-6.57	7.07	7.03-7.12	8.13	8.07-8.19	0.60	0.52-0.67	<0.001
Psychotherapy	2.89	2.85-2.93	3.64	3.60-3.68	3.31	3.28-3.34	3.59	3.54-3.63	0.47	0.42-0.52	<0.001
Medication management	1.02	1.00-1.04	1.18	1.16-1.20	1.11	1.09-1.13	1.11	1.09-1.14	0.16	0.13-0.19	<0.001
Intensity of outpatient service use among users	**N[c]**	**95% CI**	**N**	**95% CI**	**N**	**95% CI**	**N**	**95% CI**	**DD**	**95% CI**	**p**
Depression or anxiety	6.54	6.45-6.62	7.50	7.42-7.59	6.47	6.42-6.53	6.90	6.83-6.98	0.53	0.43-0.64	<0.001
Psychotherapy	10.25	10.08-10.41	11.24	11.09-11.40	9.83	9.73-9.93	10.31	10.18-10.45	0.51	0.32-0.70	<0.001
Medication management	3.63	3.56-3.70	3.58	3.52-3.64	3.48	3.43-3.53	3.42	3.36-3.48	0.01	-0.07-0.09	0.770
Mental Health Spending	**$[d]**	**95% CI**	**$**	**95% CI**	**$**	**95% CI**	**$**	**95% CI**	**DD**	**95% CI**	**p**
Total	2,065	2,014-2,115	2,817	2,756-2,878	1,877	1,848-1,907	1,969	1,928-2,010	661	595-727	<0.001
Out-of-pocket	358	352-364	456	449-452	360	355-364	378	372-383	80	72-87	<0.001
New Enrollee Analysis	**19-25 years old**				**27-33 years old**						
	Pre-DCP		**Post-DCP**		**Pre-DCP**		**Post-DCP**				
Probability of service use	**%[b]**	**95% CI**	**%**	**95% CI**	**%**	**95% CI**	**%**	**95% CI**	**DD[a]**	**95% CI**	**p**
Inpatient or Outpatient Depression or Anxiety	6.19	6.13-6.24	7.79	7.73-7.86	7.02	6.96-7.07	7.97	7.88-8.06	0.65	0.55-0.75	<0.001
Inpatient Depression or Anxiety	0.12	0.11-0.12	0.22	0.21-0.23	0.15	0.14-0.16	0.21	0.19-0.23	0.04	0.02-0.06	<0.001
Outpatient Depression or Anxiety	6.17	6.11-6.23	7.76	7.69-7.82	6.99	6.94-7.05	7.93	7.84-8.02	0.65	0.55-0.75	<0.001
Psychotherapy	2.63	2.59-2.66	3.19	3.15-3.23	3.39	3.35-3.43	3.49	3.43-3.55	0.46	0.39-0.53	<0.001
Medication management	0.92	0.90-0.94	1.03	1.01-1.06	1.17	1.14-1.19	1.11	1.07-1.15	0.17	0.13-0.21	<0.001
Intensity of outpatient service use among users	**N[c]**	**95% CI**	**N**	**95% CI**	**N**	**95% CI**	**N**	**95% CI**	**DD**	**95% CI**	**p**
Depression or anxiety	6.26	6.16-6.35	7.08	6.98-7.18	6.53	6.45-6.60	7.03	6.91-7.15	0.31	0.17-0.46	<0.001
Psychotherapy	9.86	9.68-10.05	10.45	10.26-10.63	9.80	9.67-9.93	10.27	10.06-10.49	0.11	-0.14-0.37	0.403
Medication management	3.47	3.39-3.55	3.36	3.28-3.44	3.50	3.43-3.56	3.35	3.26-3.45	0.03	-0.09-0.15	0.613
Mental Health Spending	**$[d]**	**95% CI**	**$**	**95% CI**	**$**	**95% CI**	**$**	**95% CI**	**DD**	**95% CI**	**p**
Total	1,868	1,820-1,916	2,597	2,527-2,667	1,963	1,919-2,008	2,157	2,085-2,230	535	445-625	<0.001
Out-of-pocket	351	344-358	461	453-470	371	365-377	422	412-431	60	48-72	<0.001

[a] Difference-in-differences are regression-adjusted predictions of the interaction between age group and policy period

[b] Values are regression-adjusted predictions of percentage who used services
[c] Values are regression-adjusted predictions of average services used per person per year among individuals who used services
[d] Values are regression-adjusted predictions of average dollars per person per year
Note: All regressions adjust for sex, age, census region, MSA, age group, year, and policy period

Table 2.3 Estimated effects of the DCP on mental health service use and spending among young adults with depression and anxiety diagnoses, stratified by analysis

	Primary Analysis			**New Enrollee Analysis**		
	Full Sample[a]	**Narrow Sample[b]**	**Beneficiary Sample[b]**	**Full Sample[a]**	**Narrow Sample[c]**	**Beneficiary Sample[c]**
Treatment Group:	**19-25**	**23-25**	**19-25 Dependent**	**19-25**	**23-25**	**19-25 Dependent**
Comparison Group:	**27-33**	**27-29**	**19-25 Primary**	**27-33**	**27-29**	**19-25 Primary**
Probability Outcomes (% using at least 1 service per year)						
Any inpatient or outpatient depression or anxiety service	0.60***	0.80***	0.89***	0.65***	0.70***	1.32***
Any inpatient depression or anxiety service	0.04***	0.04***	0.09***	0.04***	0.03***	0.12***
Any outpatient depression or anxiety service	0.60***	0.80***	0.88***	0.65***	0.70***	1.30***
Any outpatient psychotherapy service	0.47***	0.64***	0.24	0.46***	0.40***	0.35***
Any outpatient medication management service	0.16***	0.26***	0.03	0.17***	0.15***	0.06***
Outpatient Intensity Outcomes (N services per person per year)						
Number of depression or anxiety services, among users	0.53***	0.45***	0.10	0.31***	-0.01	0.08
Number of psychotherapy services, among users	0.51***	0.39*	0.04	0.11	-0.37	-0.25
Number of medication management services, among users	0.01	0.02	0.03	0.03	0.02	0.02
Spending Outcomes (USD per person per year)						
Total Spending	661***	678***	494***	535***	506***	509***
Out-of-pocket Spending	80***	80***	51***	60***	53***	60***

* p<0.05

** p<0.01

*** p<0.001

[a] Estimates are regression-adjusted difference-in-difference predictions from Table 2.2

[b] Estimates are regression-adjusted difference-in-difference predictions from Supplemental Table A-2

[c] Estimates are regression-adjusted difference-in-difference predictions from Supplemental Table B-2

Note: All regressions adjust for sex, age, census region, MSA, age group, year, and policy period

CHAPTER THREE: MANUSCRIPT TWO

The association between the Mental Health Parity and Addiction Equity Act and mental health care utilization and spending among young adults with depression and anxiety diagnoses

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Abstract

Objective: The purpose of this study was to examine the impact of the 2008 Mental Health Parity and Addiction Equity Act (MHPAEA) on mental health service use and spending among young adults with depression and anxiety diagnoses who have private health insurance coverage.

Methods: Data were large employer-sponsored insurance claims from the MarketScan database. Interrupted time series models were used to estimate changes in the probability of using mental health services, the quantity of services used, and average spending among younger adults 26-33 years old across two time points: the pre-policy period (2007-2009) and the post-policy period (2010-2012). Outcomes included depression and anxiety-related inpatient and outpatient services, outpatient psychotherapy and medication management, and total and out-of-pocket mental health spending.

Results: Implementation of the parity law was associated with an increase in the probability of using inpatient depression or anxiety services at the time of policy implementation, but a decrease in inpatient use over time. The probability of outpatient psychotherapy decreased initially, and the probability of medication management increased over time after the policy was implemented. The cumulative effect at one year post-implementation was a 0.2% increased probability of using inpatient services, a 7.8% decreased probability of using psychotherapy, and a 1.3% increased probability of using medication management. The number of medication management services used per month increased slightly as a result of the parity law, but the cumulative effect at one year post-implementation was 0.2 additional visits per user. Trends in total spending decreased slightly after implementation, while out-of-pocket spending remained steady.

Conclusions: Changes in service use highlight potential heterogeneity in the association between the parity law and specific services. Among young adults with depression and anxiety diagnoses, the parity law was not associated either with higher total spending as some predicted or with increased financial protection as supporters anticipated and research on other mental illnesses has found.

Introduction

The Mental Health Parity and Addiction Equity Act (MHPAEA) of 2008 responded to limitations previously placed on mental health coverage in the private insurance market. The federal parity law required group insurers with 50 or more enrollees who offer mental health and addiction benefits to provide those benefits with equal financial requirements and treatment limitations as medical and surgical benefits. Prior research evaluating the effects of parity regulations implemented at the state level and by the Federal Employees' Health Benefits Program showed that parity regulations could lead to more equitable coverage without substantially driving up health care expenditures, which was instrumental in passage of the MHPAEA [80].

Research suggests the parity law was associated with more generous mental health benefits [30, 31, 34]. Cost sharing requirements decreased among insurance plans that did not meet parity prior to the law's implementation [30]. Commercial insurers removed many treatment limitations, such as annual caps on services [31]. Changes in cost sharing and other quantitative limitations could reduce barriers to care, and some evidence has linked the elimination of treatment caps to increases in mental health service use among individuals with high intensity mental health care utilization [34]. In addition to increases in access to services, recent studies have also found improvements in financial protection against the cost of treatment [35-37].

A broad investigation of the associations between the federal parity law and behavioral health service use from 2008-2013 found increases in outpatient utilization and total spending, but no significant changes in out-of-pocket spending among enrollees covered by insurance plans with integrated behavioral health benefits; however, the service use and spending increases were small [35]. For example, trends in psychotherapy services increased by 0.00017 visits per member per month and trends in total spending increased by 88 cents per member per month over the period after implementation [35]. Evidence related to specific behavioral health conditions has demonstrated similar findings.

One study showed that the parity law led to increases in mental health service use and total spending for children with autism spectrum disorder without significant changes in out-of-pocket spending [36]. After the parity law was implemented, trends in outpatient mental health and functional therapy service use increased by 0.0015 visits per child per month and trends in total spending increased by 2 dollars per child per month [36]. Another study examined out-of-network treatment for substance use disorders and found increases in service use and total spending attributable to the parity law, but no significant changes in out-of-pocket spending [37]. Over the period after implementation, trends in inpatient and outpatient service use increased by 0.0024 hospitalizations and 0.0016 visits per person per month, respectively [37]. Trends in total spending increased by approximately $50 for inpatient services and $25 for outpatient services per person per month after the MHPAEA was implemented [37].

The substantially higher spending estimates for substance abuse treatment in relation to spending results from other studies could reflect the nature of out-of-network care, which tends to be more expensive since insurers do not negotiate service costs with non-participating providers. Additionally, the greater service use increases for both autism spectrum disorders and substance use disorders relative to overall behavioral health care may reflect how the study samples were defined. The studies examining specific disorders analyzed service use among individuals with a diagnosis, while the study of behavioral health care analyzed service use among the entire enrolled population. Including enrollees without a behavioral health diagnosis results in lower utilization rates for behavioral health services, corresponding to smaller magnitude estimates of the changes associated with implementing the federal parity law.

Research to date has described changes in access to care and financial protection for individuals with substance use disorders and developmental disorders, but the association between the parity law and changes in mental health service use and spending has not been investigated for other specific disorders. In particular, no studies have focused on depression and anxiety disorders, which are the most prevalent mental illnesses in the U.S. [1]. The recent study of all behavioral health care provides some insight into changes in utilization and spending for these common mental illnesses since over half of those who used behavioral health services had either a depression or anxiety diagnosis [35]. The results indicated that increases in behavioral health care utilization attributable to the parity law were concentrated among outpatient services, which could be explained in part by treatment for common mental illness that often occurs in ambulatory settings [35].

Adolescence and early adulthood are a critical period for treating depression and anxiety, both of which tend to emerge during these developmental stages [11]. In fact, most of the burden of disease for depression and anxiety occurs from 15-34 years of age [7]. In addition to being a high-risk period for common mental illnesses, young adulthood is associated with insurance problems such as underinsurance, which describes those with coverage for whom cost remains a barrier to treatment [12]. Most young adults 19-29 years old with health insurance are covered by an employer-sponsored plan through their own employers, but some are covered as dependents through a parent's employer plan [81]. In 2009, older young adults 24-29 years old were more than twice as likely to be covered through their own employers than those 19-23 years old [81]. Recognizing the insurance problems associated with young adulthood, comprehensive health reform achieved through the 2010 passage of the Affordable Care Act (ACA) targeted young adults with a provision that expanded access to potentially more generous dependent coverage for 19-25 year olds; however, older young adults were ineligible for coverage under the provision. Therefore, older young adults continue to rely on their own employer-sponsored private insurance as before the ACA, and more so in relation to their younger counterparts [81].

The present study focused on young adults because they are at risk of both common mental illnesses and insurance problems. The objective was to examine the relationship between the federal parity law and mental health service use and spending among older young adults 26-33 years old with depression and anxiety diagnoses, excluding young adults 19-25 years old whose service use could be affected by the ACA around the time the parity law was implemented. Among older young adults diagnosed with depression and anxiety, it was hypothesized that the parity law led to increases in: 1) the probability of inpatient and outpatient mental health service use, 2) the quantity of outpatient mental health services used and 3) total spending on mental health care, but no changes in out-of-pocket spending. The findings have implications for planning future initiatives that aim to improve access to mental health services for older young adults at higher risk of experiencing problems with mental health and insurance coverage while managing spending.

Methods

Data

Data were obtained from the Truven Health MarketScan® Commercial Claims and Encounters database, which includes inpatient, outpatient, and pharmaceutical claims for individuals insured by large employer-sponsored plans. The data are longitudinal at the individual level, allowing service utilization and costs to be calculated for each enrollee over time. The pre-parity period included data from 2007-2009, and the post-parity period included data from 2010-2012, capturing the three plan years both before and after the parity law was implemented in January 2010.

Sample

Adults 26-33 years old were included in the sample for each calendar year in which they were continuously enrolled. Adults 19-25 years old were excluded because service use and spending by this group was likely to have been impacted by the ACA. Continuous enrollment across the entire study period was not required because many young adults are susceptible to experiencing gaps in insurance coverage, especially if they have low to moderate income levels [12]. Requiring calendar year enrollment ensured averages could be calculated in all months of the year for each person without biasing the sample toward those with potentially more stable employment and higher incomes who could experience fewer cost-related barriers to care. Individuals were identified with depression and anxiety diagnoses if at least one inpatient or outpatient claim had a relevant diagnosis in the calendar year in which they met age and continuous enrollment criteria described above. The International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) diagnostic codes used to categorize these conditions were 296.2, 296.3, 300.4, and 311 for depression and 300.0, 300.2, 300.3, 309.81, and 313.0-313.2 for anxiety disorders [70].

Outcome Measures

Depression and anxiety diagnoses in addition to relevant procedure codes were used to categorize inpatient and outpatient services in order to examine outcomes for the probability and quantity of service use. Similar to other established approaches, inpatient services were categorized as depression or anxiety-related hospitalizations if at least half of all inpatient claims associated with the hospitalization had a relevant diagnosis and the last (discharge) claim also had a relevant diagnosis [36, 71]. Outpatient services were categorized according to a relevant diagnosis or procedure code on the outpatient claim. Depression and anxiety services included outpatient claims with either a depression or anxiety diagnosis. Psychotherapy and medication management services included outpatient claims with either a Current Procedural Terminology (CPT) or Healthcare Common Procedure Coding System (HCPCS) code for psychotherapy or medication management, respectively.

Probability of service use was calculated as any inpatient or outpatient depression or anxiety service, any inpatient depression or anxiety hospitalization, any outpatient depression or anxiety service, any outpatient psychotherapy, and any outpatient medication management per month. Intensity of service use was calculated as the average total number of outpatient depression or anxiety services, psychotherapy, and medication management per person per month, conditional on using the service. Total and out-of-pocket spending were calculated as average dollars spent on inpatient, outpatient, and prescription drug services per person per month, adjusted for inflation to 2012 dollars using the Consumer Price Index. Total spending included the total amount due to a provider including the out-of-pocket amount due. Out-of-pocket spending included deductibles, coinsurance, and copayments.

Analyses

A single group interrupted time series design was used to measure the association of the federal parity law with the outcomes of interest, which were aggregated to the month level for analyses. Data were analyzed with SAS statistical software using the AUTOREG procedure to obtain estimates based on the Yule-Walker method to correct for first-order autocorrelation [82]. Regression models included a binary indicator for policy period (pre-parity and post-parity) to estimate changes in outcomes at the time of implementation; a continuous term for month to estimate time trends across the study period; and an interaction term for policy period and month to estimate changes in time trends attributable to implementation. Models also included a binary indicator for each calendar month to adjust for seasonal variation in outcomes.

Results

Baseline demographic and clinical characteristics of enrollees 26-33 years old with depression and anxiety diagnoses are shown in Table 3.1. The baseline characteristics represent the first year each individual had a depression or anxiety diagnosis and continuous enrollment. The sample was mostly female, but the proportion of female enrollees decreased slightly over the study period. The average age was about 30 years old across the study period. Most enrollees lived in the southern census region and in non-rural areas. A minority of individuals had both a depression and anxiety diagnosis in the first study year (12.8%), but the proportion with both depression and anxiety diagnoses increased over time. Among those with either a depression or anxiety diagnosis alone, a larger proportion of the sample had only a depression diagnosis in the first study year (49.7%), but a larger proportion had only an anxiety diagnosis by the end of the study period (48.1%). About 20% of the sample had a comorbid mental illness other than depression or anxiety, with a slight increase over the study period. Few enrollees used inpatient depression or anxiety services and most used outpatient services. Less than half of enrollees used outpatient psychotherapy, and a minority used outpatient medication management.

Interrupted time series estimates are shown in Table 3.2. Some increases were found in the probability of using services at the time the parity law was implemented and in the trends in service use over time after implementation. At the time of implementation, the probability of inpatient depression- or anxiety-related hospitalizations increased (p=0.006), but no changes were detected in the probability of using outpatient depression or anxiety services (p=0.212). The probability of psychotherapy decreased (p=0.001), but the probability of medication management did not change (p=0.168). The decrease in psychotherapy translated to a 23.3% lower probability of using psychotherapy services by the end of the study period over the expected probability without implementing the parity law (Figure 3.1).

After implementation, trends in the probability of inpatient depression- or anxiety-related hospitalizations decreased (p=0.035), but the decreased rate of inpatient service use was too small to offset the initial increase at implementation. For example, the estimates for using inpatient depression or anxiety services amounted to a 0.3% higher probability of hospitalization by the end of the study period over the expected probability in the absence of parity. No changes were detected in trends for the probability of using outpatient depression or anxiety services (p=0.523) or psychotherapy (p=0.991), but trends in the probability of medication management increased (p=0.011). By the end of the study period, the increased rate of medication management totaled 6.2% higher probability of using medication management services over the expected probability in the absence of parity (Figure 3.2).

Similar to outcomes for the probability of using services, some increases were found in the quantity of services used per person per month at the time the law was implemented and in the trends over time after implementation. At implementation, a marginally significant decrease in quantity of use was detected for outpatient depression or anxiety services (p=0.055); no change was detected for psychotherapy (p=0.717); and the quantity of medication management significantly increased (p=0.007). After implementation, trends in the quantity of outpatient depression and anxiety services (0.138) and psychotherapy (0.596) remained steady, but trends in the quantity of medication management (p=0.045) increased. Increases in the quantity of medication management services used were small, totaling less than one additional visit per person by the end of the study period.

There were no significant changes in total (p=0.445) or out-of-pocket (p=0.701) mental health spending at the time the parity law was implemented. After implementation, trends in total mental health spending decreased (p=0.038), corresponding to a $75 decrease per person by the end of the study period over expected spending in the absence of the law. There were no changes in out-of-pocket spending (p=0.763).

Discussion

This study indicates that the federal parity law had a modest effect on mental health service use and spending among adults 26-33 years old with depression and anxiety diagnoses. At the time the parity law was implemented, the probability of using inpatient depression or anxiety services increased while the probability of using psychotherapy decreased. This pattern of results could arise directly through increased access to hospital-based care that was medically needed but inaccessible prior to the parity law due to financial and treatment limitations. Alternatively, increased inpatient utilization could result from increased access to ambulatory care that recognizes and refers individuals to inpatient treatment; however, no evidence was found of increases in the probability of using outpatient depression or anxiety services overall.

After implementation, trends in the probability of using inpatient depression or anxiety services decreased while the probability of using outpatient medication management increased. This pattern suggests that the parity law had contrasting short-term and longer-term effects, with increased inpatient use initially and increased outpatient medication management over time after implementation. In addition, insurers might have responded to early increases in inpatient care by modifying benefit structures or adopting new strategies to manage care and encourage outpatient treatment, which can reduce the need for more expensive hospital-based care. Changes in the quantity of outpatient service use associated with implementing the parity law also reflect these potential explanations.

The number of services used per person per month decreased at the time of implementation for users of outpatient depression or anxiety services and increased for users of outpatient medication management. Trends in the quantity of medication management also increased after implementation. As discussed in relation to findings for the probability of service use outcomes, hospital-based care may have become more accessible when the law was implemented. In that case, individuals with more intensive treatment needs might have accessed treatment in inpatient rather than outpatient settings, driving a decrease in the average quantity of outpatient services used at the time of implementation. This possibility is consistent with previous research suggesting parity implementation had particularly marked effects for individuals who were high intensity service users in the pre-parity period [34]. Within the outpatient setting, higher intensity medication management with no changes in psychotherapy could reflect important differences in the association between the parity law and specific services.

While access to psychotherapy could have improved as a result of the parity law, relative improvements in financial protection and access to other services may have been greater since many providers do not accept private insurance as payment for psychotherapy and other specialty psychiatric services [83]. Federal parity requirements applied to out-of-network benefits covering such services, yet the inability of insurers to negotiate lower rates with non-participating providers typically results in higher total and out-of-pocket spending that could remain a barrier to psychotherapy treatment as access to other treatment modalities improved after the law was implemented. Furthermore, the shifts away from psychotherapy toward both inpatient and outpatient alternatives could indicate differences in illness severity. Both psychological and pharmacological treatments can be effective, but research has suggested that depression is commonly treated with psychotherapy in the acute phase and with medication once remission has been achieved [4, 84].

Although changes in service use associated with the federal parity law were significant among adults 26-33 years old with depression and anxiety diagnoses, the estimates were small. Likewise, the parity law was associated a small decrease in the trend for average total mental health spending, but no changes in average out-of-pocket spending. These findings fail to demonstrate the same improvements in financial protection for beneficiaries as had been found in prior studies examining spending for services to treat autism spectrum disorders and substance use disorders [36, 37]. These results could indicate that services for depression and anxiety were nearly in compliance with parity requirements prior to the law's implementation. In that case, achieving full compliance might have produced small shifts in utilization like those found here without substantially impacting spending or improving financial protection for enrollees. The discrepancy between findings may also reflect differences across the study group definitions.

This study examined a typically healthy age group and relatively common mental illnesses with outpatient treatment options that can be effective for many people [4]. In contrast, treatment for autism spectrum disorders is often more specialized and intensive, reflected by higher average annual total mental health spending per person [36]. The study examining substance abuse treatment focused on out-of-network services, which are inherently more expensive [37]. Possibly, the parity law had the greatest impact on access to care and financial protection for disorders with more expensive treatments since higher cost services and subgroups could have been clear targets for treatment limitations and disproportionate cost sharing requirements before parity became law.

The main limitation of this study is the lack of a comparison group that was not impacted by parity requirements. The MHPAEA was a federal policy that applied to large group plans and the data included insurance claims from large employer-sponsored plans. While these insurers were precisely those targeted by the federal parity law, the scope of both the policy and the dataset limited the potential to identify an appropriate comparison group. As a result, secular changes could have influenced the outcomes measured. A key concern for this analysis was the possible impact of other health reform occurring during the study period, specifically, the passage of the ACA shortly after the parity law was implemented in 2010. Most major ACA provisions went into effect after the study period ended, but the dependent coverage expansion targeting young adults was implemented at the beginning of 2011. To exclude young adults whose service use and spending could have been impacted by the ACA, the sample was limited to those 26-33 years old who were not eligible for dependent coverage.

In addition, the large group insurance claims analyzed here were drawn from a convenience sample. Although the dataset includes around 20 million covered lives each year, the results are not necessarily generalizable to all individuals covered by large group insurance plans. Therefore, the association between the federal parity law and mental health service use and spending in other insured populations may differ from the results shown here. Furthermore, the relationship between the law and mental health service use and spending may arise through multiple pathways that could not be evaluated using insurance claims, such as through changes in providers' clinical or administrative practices. Nonetheless, the results provide the first assessment of the aggregate association between the federal parity law and mental health service use and spending among young adults with depression and anxiety diagnoses.

Conclusion

Although changes in service use associated with implementation of federal parity requirements were small, the results highlight the potential importance of the range of services that are accessible and affordable among privately insured young adults with depression and anxiety diagnoses. For federal parity to achieve the goal of improving access to care without incurring substantial increases in spending, it could be beneficial to consider benefit structures or payment models to remove persistent barriers to care and ensure options for treatment. More research is needed to understand the comprehensive impact of reforms across mental health populations and care settings. Future studies should continue to evaluate effects over time, including those related to key components of the MHPAEA that took effect with the interim and final rules in 2014 [85].

Table 3.1 Unadjusted baseline characteristics of young adults 26-33 years old with depression and anxiety diagnoses

	Pre-MHPAEA						**Post-MHPAEA**					
	2007		**2008**		**2009**		**2010**		**2011**		**2012**	
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
	65,601		70,356		68,530		66,486		71,072		74,660	
Mean Age	29.9		29.7		29.6		29.6		29.6		29.5	
Sex												
Female	46,171	70.4	48,872	69.5	47,138	68.8	45,527	68.5	48,919	68.8	50,514	67.7
Census Region												
Northeast	9,591	14.6	11,329	16.1	10,615	15.5	9,944	15.0	10,620	14.9	11,537	15.5
Midwest	17,471	26.6	17,268	24.5	15,831	23.1	14,658	22.0	14,649	20.6	17,369	23.3
South	25,867	39.4	26,657	37.9	25,707	37.5	25,010	37.6	29,539	41.6	26,773	35.9
West	12,672	19.3	15,102	21.5	16,377	23.9	16,874	25.4	16,264	22.9	18,981	25.4
Urban/rural												
MSA	56,996	86.9	62,661	89.1	60,831	88.8	59,265	89.1	63,286	89.0	67,008	89.8
Diagnoses												
Depression alone	32,606	49.7	33,026	46.9	30,176	44.0	27,458	41.3	27,566	38.8	26,378	35.3
Anxiety alone	24,576	37.5	28,391	40.4	29,004	42.3	29,189	43.9	32,774	46.1	35,938	48.1
Depression and anxiety	8,419	12.8	8,939	12.7	9,350	13.6	9,839	14.8	10,732	15.1	12,344	16.5
Comorbidities												
Any mental illness	12,817	19.5	14,158	20.1	13,931	20.3	13,852	20.8	14,806	20.8	15,854	21.2
Bipolar disorder	3,067	4.7	2,975	4.2	2,822	4.1	2,475	3.7	2,445	3.4	2,557	3.4
Substance use disorder	2,092	3.2	2,408	3.4	2,356	3.4	2,502	3.8	2,757	3.9	3,062	4.1
Service use												
Any inpatient depression or anxiety service use	1,045	1.6	1,358	1.9	1,582	2.3	1,787	2.7	1,857	2.6	1,895	2.5
Any outpatient depression or anxiety service use	65,326	99.6	70,077	99.6	68,212	99.5	66,195	99.6	70,772	99.6	74,336	99.6
Average outpatient depression or anxiety visits per year among users	6.38		6.12		5.88		5.92		6.17		6.42	
Any outpatient psychotherapy service use	29,860	45.5	30,382	43.2	27,913	40.7	25,907	39.0	27,529	38.7	28,623	38.3
Average outpatient psychotherapy visits per year among users	9.63		9.38		9.00		9.06		9.51		9.50	
Any outpatient medication management service use	10,232	15.6	8,708	12.4	7,321	10.7	6,737	10.1	6,820	9.6	6,954	9.3
Average outpatient medication management visits per year among users	3.60		3.42		3.36		3.45		3.38		3.39	
Any psychotropic medication use	47,006	71.7	49,771	70.7	48,714	71.1	47,248	71.1	50,573	71.2	52,838	70.8

Table 3.2 Interrupted time series estimates of mental health service use and spending among young adults 26-33 years old with depression or anxiety

Probability of service use	**%[a]**	**SE**	**p**
Inpatient or outpatient depression or anxiety			
Month	0.0202	0.0079	0.014
Parity	-0.2990	0.2370	0.212
Parity*Month	0.0054	0.0108	0.621
Inpatient depression or anxiety			
Month	0.0002	0.0002	0.439
Parity	0.0201	0.0071	0.006
Parity*Month	-0.0007	0.0003	0.035
Outpatient depression or anxiety			
Month	0.0075	0.0074	0.318
Parity	-0.2799	0.2214	0.212
Parity*Month	0.0065	0.0101	0.523
Psychotherapy			
Month	0.0086	0.0061	0.166
Parity	-0.6457	0.1826	0.001
Parity*Month	-0.0001	0.0084	0.991
Medication management			
Month	-0.0172	0.0016	0.000
Parity	0.0667	0.0477	0.168
Parity*Month	0.0058	0.0022	0.011
Intensity of outpatient service use among users	**N[b]**	**SE**	**p**
Depression or anxiety			
Month	0.0047	0.0006	<0.001
Parity	-0.0353	0.0181	0.055
Parity*Month	0.0012	0.0008	0.138
Psychotherapy			
Month	0.0029	0.0009	0.002
Parity	-0.0096	0.0263	0.717
Parity*Month	-0.0006	0.0012	0.596
Medication management			
Month	-0.0008	0.0002	<0.001
Parity	0.0146	0.0052	0.007
Parity*Month	0.0005	0.0002	0.045
Mental Health Spending	**$[c]**	**SE**	**p**
Total			
Month	0.32	0.07	<0.001
Parity	1.57	2.03	0.445
Parity*Month	-0.20	0.09	0.038
Out-of-pocket			
Month	0.02	0.03	0.437
Parity	0.29	0.75	0.701
Parity*Month	0.01	0.03	0.763

Note: Results were estimated using Yule-Walker regression models to correct for first-order autocorrelation. The estimates of interest include the binary policy period indicator, which represents changes in the outcome when the parity law was implemented, and the interaction between the policy period and month, which represents changes in the time trend as a result of parity implementation.

[a] Values are regression estimates of percentage who used services

[b] Values are regression estimates of average services per person per month among individuals who used services

[c] Values are regression estimates of average dollars per person per month

Figure 3.1 Difference in the probability of using outpatient psychotherapy services between observed rates and predicted rates in the absence of parity

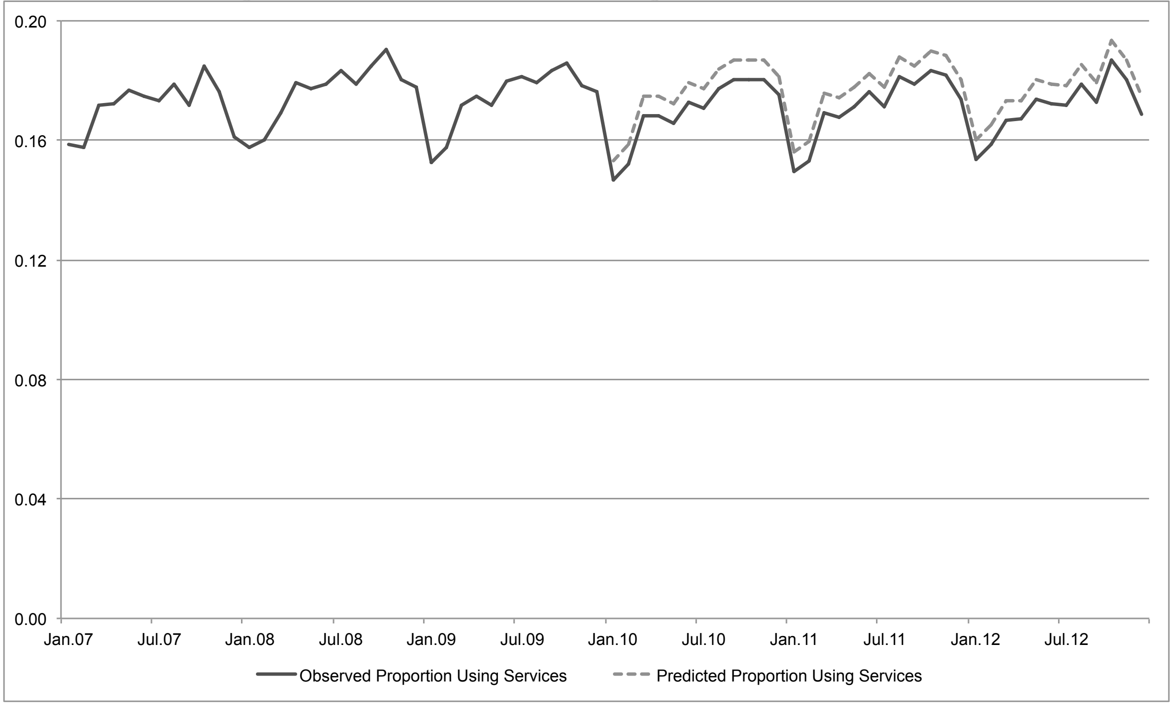
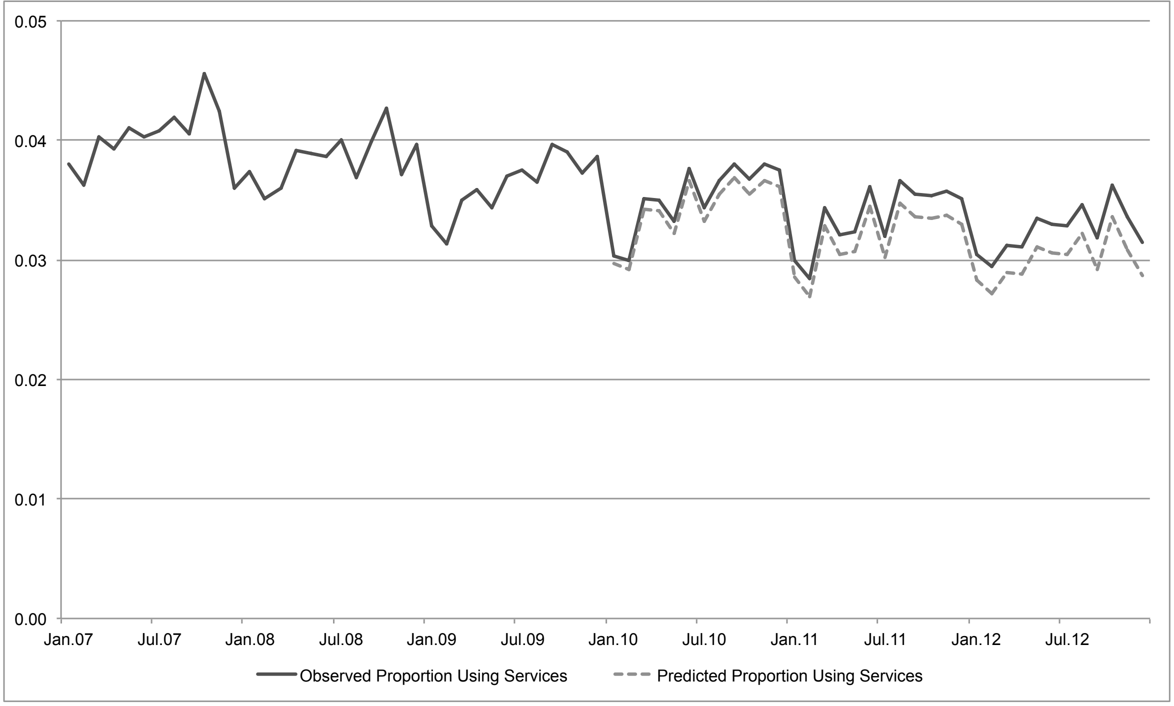


Figure 3.2 Difference in the probability of using outpatient medication management services between observed rates and predicted rates in the absence of parity



CHAPTER FOUR: MANUSCRIPT THREE

The correlates of depression care and the role of screening in depression identification and treatment in a nationally representative sample of outpatient primary care visits

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Abstract

Objective: The purpose of this study was to examine depression screening patterns and the role of screening in depression diagnosis and treatment in primary care settings.

Methods: Data were drawn from the 2005-2014 National Ambulatory Medical Care Surveys (NAMCS), which is nationally representative of visits to outpatient physician offices. Logistic regression was used to estimate the odds of depression screening, diagnosis, and treatment in order to assess the correlates of each of these stages of depression care. Logistic regression with propensity score weighting was used to estimate the odds of depression diagnosis and treatment under the counterfactual simulation that patients who visited providers with low screening rates had instead gone to providers with higher screening rates.

Results: A small proportion of outpatient primary care visits included depression screening. Visits by patients with depression symptom complaints were associated with higher odds of depression screening than visits by patients who reported other complaints. Screening was associated with higher odds of diagnosis and treatment, even when accounting for presence of symptoms. When visits were weighted to have similar demographic and clinical characteristics (e.g. sex, age, race/ethnicity, chronic comorbidities) as visits to providers with low screening rates, visits to providers with higher screening rates had higher odds of depression diagnosis and treatment than visits to providers with lower screening rates, indicating that if patients visiting providers with low screening rates instead visited providers with higher screening rates they would be more likely to be diagnosed.

Conclusions: The results suggest physicians may target patients for screening based on their symptoms and indicate that screening is associated with increased depression identification and treatment, particularly for visits with patients who have risk factors for depression.

Findings suggest raising screening rates could potentially increase depression identification and treatment rates in primary care settings.

Introduction

Primary care is the main point of access to health care in the U.S., visited by most Americans for routine checkups and new health problems, including issues that could require specialty care [40]. Consequently, general medical providers, rather than specialty mental health providers, encounter a large proportion of the population with depression. General medical providers have also assumed much of the responsibility for treating depression, largely due to medication advances and the rise of managed care [42, 86]. Yet, estimates suggest 75-85% of primary care patients with depression remain untreated [41, 43].

Low treatment rates can be partially explained by low identification rates since over half of primary care patients with depression are undiagnosed, although some patients are treated for depression without a diagnosis [43]. In fact, antidepressant prescriptions without a psychiatric diagnosis have driven the overall rise in antidepressant use over time [87]. Treatment without a psychiatric diagnosis could signal inappropriate treatment of subclinical symptoms, off-label prescribing practices, or impediments to proper diagnosis, such as fragmented medical and mental health care [87]. Regardless of treatment decisions, evidence shows primary care doctors sometimes diagnose patients' somatic complaints (e.g. fatigue, insomnia, or headache) that may indicate depression in place of diagnoses for depression and other mental illnesses [58, 59]. Physicians report diagnostic uncertainty as the primary reason for diagnosing alternatives to depression [58, 59].

Doubts about diagnosis reflect two central issues in modern depression care and mental health care more broadly. First, diagnosing mental illness requires meeting a threshold of symptoms during a specified time period [88, 89]. A depression diagnosis requires the presence of at least one of two key symptoms as well as a minimum of four additional symptoms out of nine total symptom criteria, and symptoms must persist for at least two weeks [88, 89]. Because there are no existing biological tests and depression includes a symptom profile that healthy people experience to varying degrees in daily life, identifying depression at a clinical threshold for diagnosis is complicated. Second, many primary care physicians have limited specialty training in mental health care, resulting in a lack of expertise and confidence related to diagnosing and treating mental illnesses [90].

Depression screeners have been developed to address diagnostic uncertainty. Based on evidence of their utility in primary care settings, the United States Preventive Services Task Force (USPSTF) recommends routine depression screening for adolescents and adults 12 years old and older; however, optimal screening intervals are not specified [91, 92]. Critics have argued that evidence supporting universal depression screening in primary care is deficient and have expressed concerns that practices based on these recommendations could fail to improve depression-related health outcomes for patients in primary care settings [93]. The USPSTF acknowledges that “direct evidence of the isolated health benefit of depression screening in primary care is weak” and that some patients with depression will not receive adequate treatment even with screening and diagnosis [51]. The USPSTF also recognizes concerns about false positives and unnecessary treatment raised by critics, but concludes that the benefits of screening outweigh the potential harms [51, 93]. Yet, depression screening is rare in primary care settings, suggesting that physicians continue to rely on their clinical judgment to diagnose depression or to screen patients only under certain circumstances [94, 95].

Considering the apparent division between current recommendations and practice, the purpose of this study was twofold. One objective was to examine current practices for evidence of targeted screening by analyzing the correlates of depression screening in primary care. Higher odds of screening were hypothesized for visits in which patients reported a depression symptom as their primary complaint compared to those reporting other reasons for the visit since these symptoms may signal to providers to confirm or rule out depression when diagnosing and treating patients.

A second objective was to estimate the relationship between screening and depression diagnosis and treatment outcomes, including the potential impact of increasing screening rates on rates of diagnosis and treatment. To do this, the association between screening and depression diagnosis and treatment was examined, hypothesizing higher odds of both diagnosis and treatment for visits in which screening was conducted compared to visits without screening. Then, the relationship between screening rates and depression diagnosis and treatment outcomes was assessed by comparing visits to providers with higher screening rates to visits to providers with lower screening rates. Higher odds of diagnosis and treatment were hypothesized for visits to providers with higher screening rates compared to visits to providers with lower screening rates. Since provider screening rates could reflect differences in their patient populations instead of differences in their screening practices, propensity score weighting was used to address potential confounding by patient characteristics that might influence provider screening rates, such as depression symptoms and other measures of health status. Propensity score weights controlled for observed patient characteristics to examine diagnosis and treatment outcomes as if patients who visited providers with lower screening rates instead visited providers with higher screening rates.

Methods

Data

Data were from the National Ambulatory Medical Care Survey (NAMCS), which is a nationally representative survey of outpatient visits to physician offices conducted annually by the National Center for Health Statistics (NCHS). Census Bureau representatives fielded data collection each year, which relied largely on physician respondents until 2012 when computer-assisted technology was introduced to extract information from visit records with a quality control protocol to ensure comparability across years [96]. NAMCS includes patient characteristics, diagnostic and prescription medication information, and encounter-level details. Analyses were conducted using data from 2005-2014, the most recent available survey year at the time of these analyses.

Sample

The sample included visits with adolescents and adults 12 years old and older because the USPSTF depression screening recommendations apply to this age group. General medical care was defined as visits to providers who specialize in general or family medicine, internal medicine, pediatrics, or obstetrics and gynecology. The primary motivation was to understand screening as a detection tool rather than as a monitoring tool; therefore, visits were included if the major reason for the visit was identified as preventive or acute care. Additionally, the sample was limited to visits by patients who had no prior-year visits in order to exclude visits by patients who could have been screened during a previous visit.

Measures

Complaints, symptoms, or other reasons for the visit in the patient’s own words are recorded for each visit and coded according to a classification system designed for NCHS [97]. If the patient’s primary reason for the visit was a symptom category indicative of depression criteria in the Diagnostic and Statistical Manual of Mental Disorders (DSM) that might be predictive of possible depression, then the primary complaint was categorized as a depression symptom [88]. These symptom categories included depression (e.g. sadness, hopelessness); tiredness/exhaustion (e.g. fatigue, lack of energy); abnormal appetite (e.g. excessive appetite, decreased appetite); weight gain or loss; anxiety/nervousness (e.g. upset, worried); sleep disturbances (e.g. trouble falling asleep, sleepiness); restlessness; memory problems (e.g. forgetfulness), lack of libido (e.g. loss of sex drive), self-esteem problems (e.g. guilt, lack of motivation) and other mental health-related symptoms (e.g. can't cope, danger to self).

Depression screening was among a checklist of the diagnostic and screening services that were ordered or provided during the visit. For this study, visits were identified as including depression screening if depression screening was indicated on the record. Provider screening rates were calculated as the number of visits with a depression screening out of all initial yearly visits sampled for each provider.

Up to three diagnoses were recorded for each patient visit, which were coded according to the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) [70]. An additional item asked, "Regardless of the diagnoses previously listed, does the patient now have depression"? For the purposes of this study, depression diagnosis was defined as either an ICD-9-CM code for depression corresponding to DSM-IV-TR depression diagnoses (296.2, 296.3, 300.4, and 311) or an affirmative response to the additional item indicating the patient had depression [98].

Both medication and non-medication treatment were recorded if they were ordered or provided during the visit. For this study, depression treatment was defined as either psychotherapy or antidepressant medication. Psychotherapy was identified by records indicating that either psychotherapy or other mental health counseling was ordered or provided during the visit. Medications were coded by NCHS according to their components and therapeutic classification using a proprietary database [99]. Antidepressant treatment was identified by records indicating any medication in the therapeutic class of antidepressants was ordered or provided during the visit. The antidepressant class encompassed selective serotonin reuptake inhibitors (SSRIs), tricyclic antidepressants (TCAs), monoamine oxidase inhibitors (MAOIs), tetracyclic antidepressants (TeCAs), selective serotonin-norepinephrine reuptake inhibitors (SSNRIs), phenylpiperazine antidepressants, and miscellaneous antidepressants.

Additional characteristics associated with depression care in previous research in primary care settings were included [100-103]. Measures of demographic and clinical characteristics included patient sex, age, race/ethnicity, insurance, census region, urban/rural area measured by metropolitan statistical area (MSA), and the presence of any comorbid chronic condition (defined in the visit record as arthritis, asthma, cancer, cerebrovascular disease, congestive heart failure, chronic renal failure, chronic obstructive pulmonary disease, diabetes, hyperlipidemia, hypertension, ischemic heart disease, obesity, and osteoporosis). Covariates associated with the clinical encounter included patient status (new or established); physician status as the patient's primary care provider; visit type (preventive or acute care); and the year in which the visit occurred.

Analyses

Data were analyzed using the svy suite of commands for survey data in Stata statistical software, Version 13.1 [72]. NCHS guidelines were followed to account for the complex, multi-stage sampling design, incorporating patient visit weights to obtain estimates that are nationally representative of outpatient visits at the patient level [104].

Logistic regressions separately estimated the odds of depression screening, diagnosis, and treatment among outpatient primary care visits. The screening outcome compared patients who reported a depression symptom as their primary complaint to those reporting other reasons for the visit. The diagnosis and treatment outcomes compared visits in which screening was conducted to visits without screening. Predicted probabilities of depression diagnosis and treatment were computed, comparing screening across patient complaints (depression symptoms and other reasons for the visit) to assess how the effect of screening differed by the primary reason for the visit. All models adjusted for the patient and encounter characteristics described above.

To examine the relationship between provider screening rates and depression diagnosis and treatment outcomes, visits to providers with higher screening rates were compared to visits to providers with lower screening rates. Screening rates were calculated among the visits sampled for each provider, and the provider rates were summarized using survey weights to obtain estimates that are representative of outpatient visits at the physician level. The distribution of provider screening rates was used to define high-rate screeners as providers with screening rates at or above the 95th percentile.

The goal was to estimate diagnosis and treatment outcomes in relation to provider screening rates, but screening rates could reflect differences either at the provider level or across the patients who visit them. To account for potential differences in the patient populations seen by providers with high (≥ 95th percentile) and low (< 95th percentile) screening rates, propensity score weighting was used to balance visits to higher-rate screeners with visits to lower-rate screeners in terms of providers' patient panels.

First, propensity scores were calculated from a logistic regression predicting the probability of visiting a provider with a low screening rate based on observed demographic and clinical characteristics that may influence screening. The model incorporated direct measures of health, including the presence of a chronic condition and depression symptom reporting, in addition to patient characteristics that are predictive of health status and health care utilization, including sex, age, race/ethnicity, insurance, census region, and urban/rural area. Propensity score estimates also incorporated survey sampling weights but no other survey design variables (i.e. strata and clusters) [105].

Then, inverse probability of treatment weights (IPTW) were calculated from the propensity scores to weight visits to providers with higher screening rates. The weighted group of visits to higher-rate screeners and the group of visits to lower-rate screeners were well balanced in terms of demographic and clinical characteristics. New weights were calculated from the product of IPTW and survey sampling weights and then applied with the survey design variables to models for depression diagnosis and treatment in order to obtain estimates that are nationally representative of outpatient visits by patients who visited providers with low screening rates [105]. This weighting scheme allowed the diagnosis and treatment outcomes of interest to be examined as if the patients who went to providers with lower screening rates had instead gone to providers with higher screening rates.

Results

Sample characteristics of initial annual outpatient visits to general medical providers by adolescents and adults 12 years old and older are presented in Table 4.1. The sample (N=16,447) represented visits by patients who were mostly female (64.7%), white (69.8%), privately insured (65.2%), and living in more urban areas (89.5%). Depression symptoms were reported as the patient's primary complaint for 2.2% of visits, and depression screening occurred in 3.0% of visits overall. Screening was conducted in 10.5% of visits in which depression symptoms were the primary patient complaint, as opposed to 2.8% of visits in which other complaints were the primary reason for the visit (data not shown). Depression was identified in 6.1% of visits, and depression treatment was ordered or provided in 7.5%

of visits. Overall, 3.1% of visits included both a depression diagnosis and treatment (data not shown).

Adjusted regression results for depression screening, diagnosis, and treatment are presented in Table 4.2. Visits were associated with higher odds of depression screening if a depression symptom was the patient's primary complaint (OR=5.57, $p<0.001$). Additional correlates associated with higher odds of screening included comorbid chronic conditions (OR=1.42, p=0.011), female sex (OR=1.39, p=0.032), identifying the physician as the primary care provider for the patient (OR=1.44, p=0.042), and identifying the visit as preventive care (OR=2.77, $p<0.001$). Living in the West was associated with lower odds of screening (OR=0.42, p=0.007).

Visits were associated with higher odds of depression diagnosis if screening was conducted (OR=4.13, $p<0.001$) and if a depression symptom was the patient's primary complaint (OR=7.72, $p<0.001$). The association between screening and the probability of depression diagnosis was stronger for visits with depression symptom complaints than for visits with other complaints (Figure 4.1). Additional correlates associated with higher odds of depression identification included female sex (OR=1.95, $p<0.001$), early (OR=1.58, p=0.004) to middle adulthood (OR=1.54, p=0.009), public insurance, living in the Midwest (OR=1.75, p=0.004) or the West (OR=1.54, p=0.020), and identifying the physician as the primary care provider for the patient (OR=1.22, p=0.044). Characteristics associated with decreased odds of diagnosis were adolescent age (OR=0.43, p=0.001), black (OR=0.54, $p<0.001$) or other race (OR=0.49, p=0.004), and self-pay status (OR=0.68, p=0.048).

Visits were associated with higher odds of depression treatment if screening was conducted (OR=1.83, p=0.007) and if a depression symptom was the patient's primary complaint (OR=3.52, $p<0.001$). The association between screening and the probability of depression treatment was slightly stronger for visits with depression symptom complaints than for visits with other complaints (Figure 4.1). Additional correlates associated with higher odds of treatment were depression diagnosis (OR=15.53, p<0.001), female sex (OR=1.51, p<0.001), early and middle ages, living outside the Northeast, and time (OR=1.06, p<0.001). Characteristics associated with decreased odds of treatment were adolescent ages (OR=0.40, p<0.001), black (OR=0.66, p=0.008) and other races (OR=0.57, p=0.004), self-pay (OR=0.56, p=0.009) or other insurance status (OR=0.60, p=0.001).

While depression screening occurred in 3.0% of visits overall, providers varied in the frequency of depression screening within their sampled visits. On average, providers (N=4,289) screened in 3.1% of their sampled visits, but the median screening rate was 0.0%. Providers at or above the 95th percentile of screening rates screened in 5% or more of their visits and were categorized as high rate screeners (N=274 providers).

Sample characteristics before and after weighting visits to have similar demographic and clinical characteristics as visits to providers with low screening rates are presented in Table 4.3. Before weighting, most demographic characteristics of visits to providers with higher screening rates were not significantly different from visits to providers with lower screening rates; however, a higher proportion of visits to providers with higher screening rates were with patients who reported a depression symptom as the primary reason for the visit (p=0.010). After propensity score weighting, there were no significant differences in demographic and clinical characteristics between visits to providers with higher and lower screening rates.

Adjusted regression results for diagnosis and treatment comparing visits by demographically and clinically similar patients to providers who screened at higher rates with providers who screened at lower rates are presented in Table 4.4. Visiting a provider who screened at rates above the 95th percentile of screening rates was associated with increased odds of depression diagnosis (OR=1.96, p<0.001) and treatment (OR=1.60, p=0.001). This translates into a 4.5% higher probability of depression diagnosis (95% CI=2.7-6.4) and a 3.3% higher probability of depression treatment (95% CI=1.2-5.4) for visits to providers with higher screening rates compared to visits to providers with lower screening rates (Figure 4.2).

Discussion

In this nationally representative study of initial annual visits to outpatient primary care settings, a relatively small percentage of physicians screened patients for depression. Despite evidence that depression screening has good diagnostic accuracy in primary care, the low rates of screening in general medical settings suggest that most physicians rely on their clinical judgment to identify cases or refer potential cases to specialists [50, 106]. Others might overlook depression altogether due to resource or time constraints; although, most depression screeners are brief, easy to score and interpret, validated for use in multiple populations, and effective for both detection and monitoring. Furthermore, two-question screeners have been developed and validated for use in both adult and adolescent populations to address primary care providers' many responsibilities and often brief visit times [107, 108]. Nonetheless, the association between depression screening and clinical risk factors, including depression symptom complaints and comorbid chronic conditions, indicate that providers might target higher risk patients when they conduct depression screening.

The findings also showed an association between these risk factors and depression diagnosis and treatment outcomes when controlling for screening, suggesting providers identify and treat higher risk patients regardless of whether their decisions are aided by depression screening; although, the relationship between depression symptom complaints and diagnosis was dependent on whether screening was conducted. The difference in the probability of diagnosis between visits with patients who reported depression symptom complains and those who reported other reasons for the visit was higher when screening was conducted. This result could suggest that providers who fail to recognize depression symptom complaints as related to possible depression might not identify depression in the absence of screening. Another possibility is that this result reflects improved predictive accuracy of screening tools when applied to a group with higher depression prevalence, assuming patients with depression symptom complaints are simply more likely to have depression.

When visits were weighted to have similar patient characteristics as visits to providers with lower screening rates, the results indicated that the probability of depression diagnosis and treatment would be higher if patients who visited providers with lower screening rates instead went to providers with higher screening rates. Since weights incorporated demographic and clinical characteristics, including whether depression symptoms were reported as the primary reason for the visit, these findings suggest depression identification and treatment might be increased if providers had higher screening rates regardless of their case-mix. Nonetheless, additional characteristics that were not included in the weights could have differed between patients who visited providers with higher and lower screening rates. One limitation of this analysis was unobserved or incomplete patient data that could have affected the extent to which patients visiting providers with higher and lower screening rates had comparable demographic and clinical characteristics.

For example, health status was measured by the presence or absence of a comorbid chronic condition, but lifestyle factors like exercise and tobacco use could also be important indicators of the health of each patient population. Although exercise information is not recorded, the NAMCS includes both body mass index (BMI)—calculated from direct clinical measures of height and weight—and tobacco use. Due to a high proportion of missing values in this sample of visits, neither BMI nor tobacco use were included in the weights. In addition, the data did not include indicators of socioeconomic status (SES), which is correlated with health and access to care. Health insurance served as a proxy for SES, but information about patients' education, income, or occupation might have improved balance between patient populations.

Furthermore, the public survey data restricted the physician characteristics that were available for analyses. Physicians had low screening rates overall, with few physicians screening at rates higher than 5% of initial annual visits and almost none screening universally in all their sampled visits. Without more information about physicians, it was not possible to assess or adjust for provider characteristics that potentially were associated with screening at a higher or lower rate. In addition to demographic data, information about physicians' training, experience, and practice characteristics could help explain differences in screening rates where they exist and could offer insight about variation across providers that is unrelated to depression care. While the results showed that higher screening rates were associated with higher diagnosis and treatment rates, focus areas for raising screening rates are inconclusive.

Moreover, this analysis was limited by the inability to evaluate implications for current recommendations to screen universally in relation to depression symptom severity or potential need for treatment since screening results were not available. Thus, the extent to which higher diagnosis rates arise from false positive screening and higher treatment rates represent unnecessary treatment could not be determined.

Finally, a general limitation of cross-sectional data is that temporality cannot be determined. For this study, cross-sectional data precluded following patients over time or determining the order of depression care processes within a visit. For example, a visit with a depression symptom complaint, screening, diagnosis, and treatment could reflect either a patient who presents with a depression symptom and then receives screening, diagnosis, and treatment or a patient who was previously diagnosed, but experiences persistent symptoms that are monitored using screening and treated continuously. While depression detection is the main goal of screening and might represent the purpose of screening for the majority of visits in which screening is conducted, the sample was limited to initial annual visits for acute and preventive care to exclude cases where depression screening was conducted to monitor symptoms.

Although the data present challenges, this analysis benefitted from the unique survey structure of NAMCS, which allowed aggregate calculations at the physician level (i.e. depression screening rates) in addition to analyses of visits at the patient level. Consequently, the findings are generalizable to depression care provided in office-based outpatient visits to primary care providers.

Conclusions

Significant progress has been made to improve depression care in general medical settings, but important challenges remain for conventional primary care practices [44]. Though physicians generally find depression screening helpful, primary care settings often have limited personnel, time, and other resources to address mental health problems [48, 51]. The evidence presented here suggests targeted screening based on risk factors might be typical practice and that even modest increases in targeted screening rates could also increase rates of depression identification and treatment. More research is needed to understand approaches to increase screening rates in order to ensure that high-risk groups are screened appropriately without exacerbating disparities in care [109].

Aiming for universal depression screening has been recommended to improve detection and proposed as an approach to reduce disparities in care, but universal programs are also susceptible to important unintended consequences, such as substantially more false positives and unnecessary treatment [53, 110]. Furthermore, supports in representative settings may be insufficient to implement extensive interventions, whereas focused protocols for screening and follow-up might be more feasible. Consistent with guidelines for addressing depression in primary care that elaborate beyond the USPSTF screening recommendations, the findings presented here emphasize the importance of physicians' ability to recognize the risk factors and common presentations of depression while highlighting the potential advantages of screening when depression is suspected [111].

While strategic screening programs could improve depression identification and avoid unintended consequences, screening remains one aspect in a complex network of contextual influences that impact depression outcomes. Future research should incorporate patient outcomes whenever possible while continuing to examine the individual and structural factors associated with depression treatment in primary care settings [41].

Table 4.1 Descriptive characteristics of patient visits to outpatient primary care, stratified by screening status

	Total		Screened		Unscreened		
	N	%	N	%	N	%	p
	16,447		478	3.0	15,969	97.0	
Depression Care							
Depression Diagnosis	1,081	6.1	123	21.4	958	5.6	<0.001
Depression Treatment	1,323	7.5	111	20.5	1,212	7.1	<0.001
Clinical Characteristics							
Depression Symptoms	370	2.2	45	7.8	325	2.1	0.001
Chronic Comorbidities	5,746	34.6	200	42.0	5,546	34.3	0.029
Demographic Characteristics							
Sex							
Female	10,870	64.7	359	71.8	10,511	64.5	0.031
Male	5,577	35.3	119	28.2	5,458	35.5	0.031
Age							
12-17	1,775	9.9	42	9.9	1,733	9.9	0.979
18-24	2,003	13.0	44	9.6	1,959	13.1	0.039
25-34	2,923	18.4	76	17.3	2,847	18.4	0.648
35-44	2,905	18.5	91	20.5	2,814	18.4	0.463
45-54	2,722	16.6	87	16.6	2,635	16.6	0.989
55-64	2,214	13.2	80	15.7	2,134	13.1	0.249
65+	1,905	10.5	58	10.5	1,847	10.5	0.996
Race/Ethnicity							
White	11,900	69.8	345	69.4	11,555	69.8	0.907
Black	1,687	11.2	43	9.3	1,644	11.3	0.238
Hispanic	1,972	13.2	64	14.1	1,908	13.2	0.737
Other	888	5.8	26	7.2	862	5.7	0.625
Insurance							
Private	10,398	65.2	309	66.4	10,089	65.1	0.775
Medicaid	1,341	7.8	41	7.3	1,300	7.9	0.742
Medicare	1,717	9.6	51	10.0	1,666	9.6	0.826
Self Pay	1,112	7.5	37	7.3	1,075	7.5	0.927
Other	1,879	9.9	40	9.0	1,839	9.9	0.764
Census Region							
Northeast	2,223	16.9	86	26.8	2,137	16.6	0.056
Midwest	4,198	20.2	119	19.0	4,079	20.3	0.712
South	5,882	39.0	171	38.8	5,711	39.0	0.967
West	4,144	23.9	102	15.4	4,042	24.2	0.004
MSA							
Urban	14,309	89.5	428	92.2	13,881	89.5	0.203
Rural	2,138	10.5	50	7.8	2,088	10.5	0.203
Encounter Characteristics							
Patient Status							
New patient	6,873	40.1	228	45.4	6,645	39.9	0.164
Established patient	9,574	59.9	250	54.6	9,324	60.1	0.164
Provider Status							
Patient's PCP	9,563	57.3	255	48.5	9,308	57.5	0.046
Not the patient's PCP	6,884	42.7	223	51.5	6,661	42.5	0.046
Visit Type							
Acute care	9,250	56.7	185	34.3	9,065	57.4	<0.001
Preventive care	7,197	43.3	293	65.7	6,904	42.6	<0.001

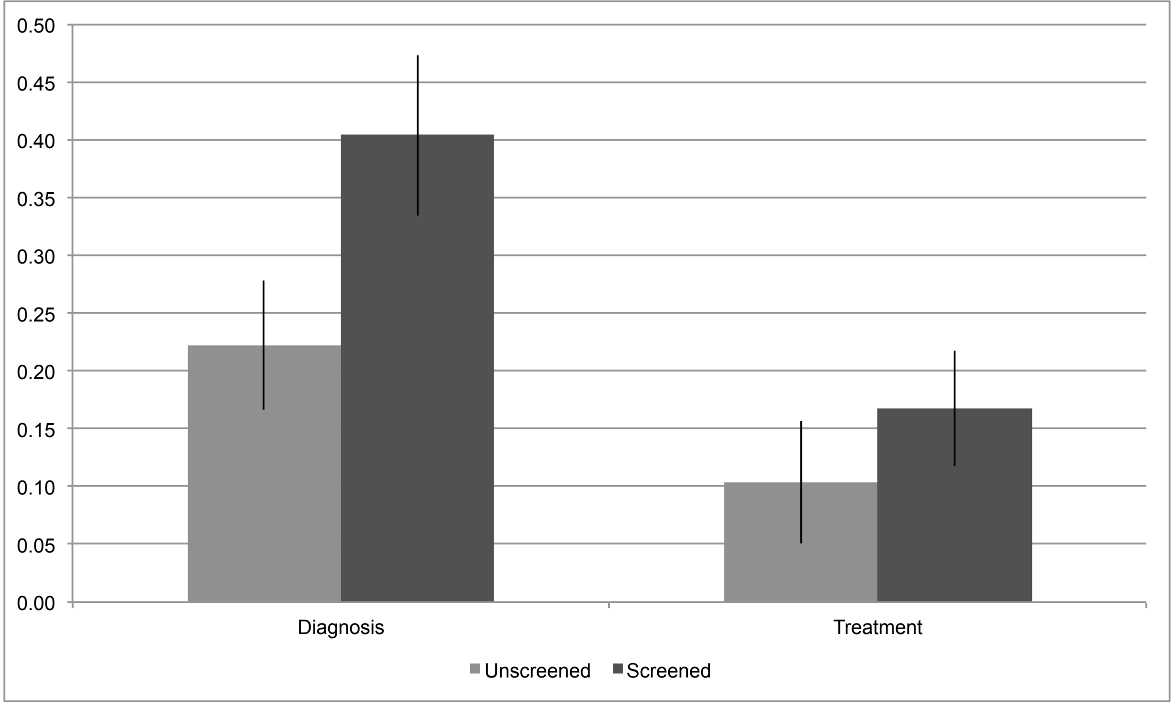
Table 4.2 Adjusted regression results for depression screening, diagnosis, and treatment among initial annual patient visits to outpatient primary care (N=16,447)

	Depression Screening			Depression Diagnosis			Depression Treatment		
	OR	**95% CI**	**p**	**OR**	**95% CI**	**p**	**OR**	**95% CI**	**p**
Depression Care									
Depression Screening									
No				1.00	Ref.	—	1.00	Ref.	—
Yes				4.13	2.99-5.70	<0.001	1.83	1.18-2.85	0.007
Depression Diagnosis									
No							1.00	Ref.	—
Yes							15.53	12.56-19.21	<0.001
Clinical Characteristics									
Depression Symptoms									
No	1.00	Ref.	—	1.00	Ref.	—	1.00	Ref.	—
Yes	5.57	3.39-9.15	<0.001	7.72	5.63-10.59	<0.001	3.52	2.26-5.49	<0.001
Chronic Comorbidities	1.42	1.08-1.86	0.011	1.92	1.60-2.31	<0.001	1.15	0.96-1.37	0.133
Demographic Characteristics									
Sex									
Male	1.00	Ref.	—	1.00	Ref.	—	1.00	Ref.	—
Female	1.39	1.03-1.87	0.032	1.95	1.55-2.44	<0.001	1.51	1.26-1.80	<0.001
Age									
12-17	1.39	0.78-2.47	0.258	0.43	0.26-0.71	0.001	0.40	0.25-0.64	<0.001
18-24	1.00	Ref.	—	1.00	Ref.	—	1.00	Ref.	—
25-34	1.26	0.82-1.93	0.302	1.30	0.90-1.87	0.163	1.33	0.98-1.81	0.070
35-44	1.38	0.88-2.17	0.166	1.58	1.16-2.14	0.004	1.60	1.18-2.15	0.002
45-54	1.21	0.74-1.96	0.448	1.54	1.11-2.11	0.009	2.03	1.48-2.79	<0.001
55-64	1.28	0.79-2.08	0.323	1.32	0.90-1.95	0.157	1.47	1.05-2.04	0.023
65+	1.10	0.62-1.93	0.750	0.80	0.49-1.30	0.365	1.26	0.80-1.98	0.312
Race/Ethnicity									
White	1.00	Ref.	—	1.00	Ref.	—	1.00	Ref.	—
Black	0.77	0.52-1.13	0.178	0.54	0.38-0.75	<0.001	0.66	0.49-0.90	0.008
Hispanic	1.16	0.77-1.73	0.480	0.76	0.56-1.04	0.083	0.92	0.68-1.25	0.595
Other	1.40	0.60-3.26	0.441	0.49	0.30-0.79	0.004	0.57	0.39-0.84	0.004
Insurance									
Private	1.00	Ref.	—	1.00	Ref.	—	1.00	Ref.	—
Medicaid	0.90	0.53-1.51	0.680	1.65	1.19-2.30	0.003	0.92	0.65-1.30	0.642
Medicare	1.04	0.67-1.63	0.849	2.07	1.40-3.07	<0.001	1.13	0.78-1.62	0.519
Self Pay	1.06	0.60-1.88	0.841	0.68	0.46-1.00	0.048	0.56	0.36-0.87	0.009
Other	1.09	0.52-2.30	0.815	1.10	0.48-1.46	0.485	0.60	0.44-0.82	0.001
Census Region									
Northeast	1.00	Ref.	—	1.00	Ref.	—	1.00	Ref.	—
Midwest	0.65	0.36-1.17	0.152	1.75	1.19-2.58	0.004	1.65	1.27-2.15	<0.001
South	0.71	0.39-1.29	0.261	1.35	0.94-1.93	0.103	1.38	1.08-1.77	0.011
West	0.42	0.22-0.79	0.007	1.54	1.07-2.21	0.020	1.41	1.06-1.87	0.017
MSA									
Rural	1.00	Ref.	—	1.00	Ref.	—	1.00	Ref.	—
Urban	1.47	0.86-2.53	0.161	0.88	0.67-1.14	0.333	0.95	0.71-1.28	0.744
Encounter Characteristics									
Patient Status									

Established patient	1.00	Ref.	—	1.00	Ref.	—	1.00	Ref.	—
New patient	1.06	0.75-1.50	0.751	1.13	0.95-1.35	0.172	1.01	0.83-1.22	0.924
Provider Status									
Not the patient's PCP	1.00	Ref.	—	1.00	Ref.	—	1.00	Ref.	—
Patient's PCP	1.44	1.01-2.04	0.042	1.22	1.01-1.48	0.044	1.19	0.96-1.47	0.109
Visit Type									
Acute care	1.00	Ref.	—	1.00	Ref.	—	1.00	Ref.	—
Preventive care	2.77	2.02-3.79	<0.001	0.96	0.80-1.15	0.630	1.11	0.94-1.31	0.203
Year	0.96	0.88-1.04	0.314	1.04	1.00-1.07	0.054	1.06	1.03-1.10	<0.001

Note: All estimates are adjusted for patient sex, age, race/ethnicity, insurance, census region, urban/rural status, any comorbid chronic condition; patient status (new or established); physician status as the patient's primary care provider; visit type (preventive or acute problem); and year.

Figure 4.1 Difference in predicted probability of depression diagnosis and treatment between visits with and without depression symptom complaints, stratified by screening status



Note: All estimates are adjusted for patient sex, age, race/ethnicity, insurance, census region, urban/rural status, any comorbid chronic condition; patient status (new or established); physician status as the patient's primary care provider; visit type (preventive or acute problem); and year. Estimates for treatment are further adjusted for depression diagnosis.

Table 4.3 Descriptive characteristics of visits by patients with no prior-year visits before and after inverse-probability of treatment weighting, stratified by visits to providers with high and low screening rates

	Unweighted					**Weighted**				
	High-Rate		**Low-Rate**			**High-Rate**		**Low-Rate**		
	N	**%**	**N**	**%**	**p**	**N**	**%**	**N**	**%**	**p**
	1,351	**7.9**	**15,096**	**92.1**		**1,351**	**50.1**	**15,096**	**49.9**	
Depression Care										
Depression Diagnosis										
Yes	172	11.1	909	5.7	<0.001	172	10.4	909	5.7	<0.001
No	1,179	88.9	14,187	94.3	<0.001	1,179	89.6	14,187	94.3	<0.001
Depression Treatment										
Yes	192	12.9	1,131	7.1	<0.001	192	12.4	1,131	7.1	<0.001
No	1,159	87.1	13,965	92.9	<0.001	1,159	87.6	13,965	92.9	<0.001
Clinical Characteristics										
Depression symptoms										
Yes	67	4.6	303	2.0	0.010	67	2.1	303	2.0	0.950
No	1,284	95.4	14,793	98.0	0.010	1,284	97.9	14,793	98.0	0.950
Chronic Comorbidities	513	37.1	5,233	34.3	0.219	513	34.5	5,233	34.3	0.949
Demographic Characteristics										
Sex										
Female	913	68.3	9,957	64.4	0.139	913	65.6	9,957	64.4	0.679
Male	438	31.7	5,139	35.6	0.139	438	34.4	5,139	35.6	0.679
Age										
12-17	122	8.8	1,653	10.0	0.456	122	9.7	1,653	10.0	0.874
18-24	164	13.5	1,839	12.9	0.663	164	12.7	1,839	12.9	0.869
25-34	233	18.7	2,690	18.3	0.828	233	18.7	2,690	18.3	0.853
35-44	248	18.7	2,657	18.5	0.882	248	19.0	2,657	18.5	0.753
45-54	240	16.3	2,482	16.6	0.819	240	16.4	2,482	16.6	0.884
55-64	196	13.8	2,018	13.2	0.671	196	13.3	2,018	13.2	0.901
65+	148	10.2	1,757	10.5	0.833	148	10.2	1,757	10.5	0.850
Race/Ethnicity										
White	962	67.7	10,938	70.0	0.478	962	70.6	10,938	70.0	0.826
Black	124	10.4	1,563	11.3	0.547	124	12.0	1,563	11.3	0.657
Hispanic	190	16.0	1,782	13.0	0.310	190	11.9	1,782	13.0	0.637
Other	75	5.9	813	5.8	0.941	75	5.5	813	5.8	0.855
Insurance										
Private	878	65.3	9,520	65.2	0.958	878	66.3	9,520	65.2	0.722
Medicaid	110	8.0	1,231	7.8	0.877	110	7.7	1,231	7.8	0.901
Medicare	133	9.3	1,584	9.6	0.869	133	9.4	1,584	9.6	0.916
Self Pay	112	8.5	1,000	7.4	0.506	112	7.1	1,000	7.4	0.862
Other	118	8.8	1,761	10.0	0.616	118	9.5	1,761	10.0	0.816
Census Region										
Northeast	226	23.8	1,997	16.3	0.089	226	15.7	1,997	16.3	0.861
Midwest	360	21.7	3,838	20.1	0.646	360	19.8	3,838	20.1	0.918
South	406	33.9	5,476	39.4	0.190	406	39.8	5,476	39.4	0.924
West	359	20.6	3,785	24.2	0.263	359	24.7	3,785	24.2	0.883
MSA										
Urban	1,197	93.0	13,112	89.2	0.053	1,197	89.1	13,112	89.2	0.968
Rural	154	7.0	1,984	10.8	0.053	154	10.9	1,984	10.8	0.968
Encounter Characteristics										
Patient Status										

Established patient	572	38.2	6,301	40.2	0.505	572	38.9	6,301	40.2	0.670
New patient	779	61.8	8,795	59.8	0.505	779	61.1	8,795	59.8	0.670
Provider Status										
Not the patient's PCP	689	50.1	8,874	57.9	0.036	689	51.9	8,874	57.9	0.102
Patient's PCP	662	49.9	6,222	42.1	0.036	662	48.1	6,222	42.1	0.102
Visit Type										
Acute care	736	50.5	8,514	57.2	0.040	736	50.8	8,514	57.2	0.048
Preventive care	615	49.5	6,582	42.8	0.040	615	49.2	6,582	42.8	0.048

[a] Unweighted refers to inverse probability of treatment weighting. Percentages are survey-weighted to be nationally representative and may not add to 100%.

[b] Weighted refers to inverse probability of treatment weighting. Percentages are weighted using the product of survey weights and inverse probability weights calculated from propensity scores.

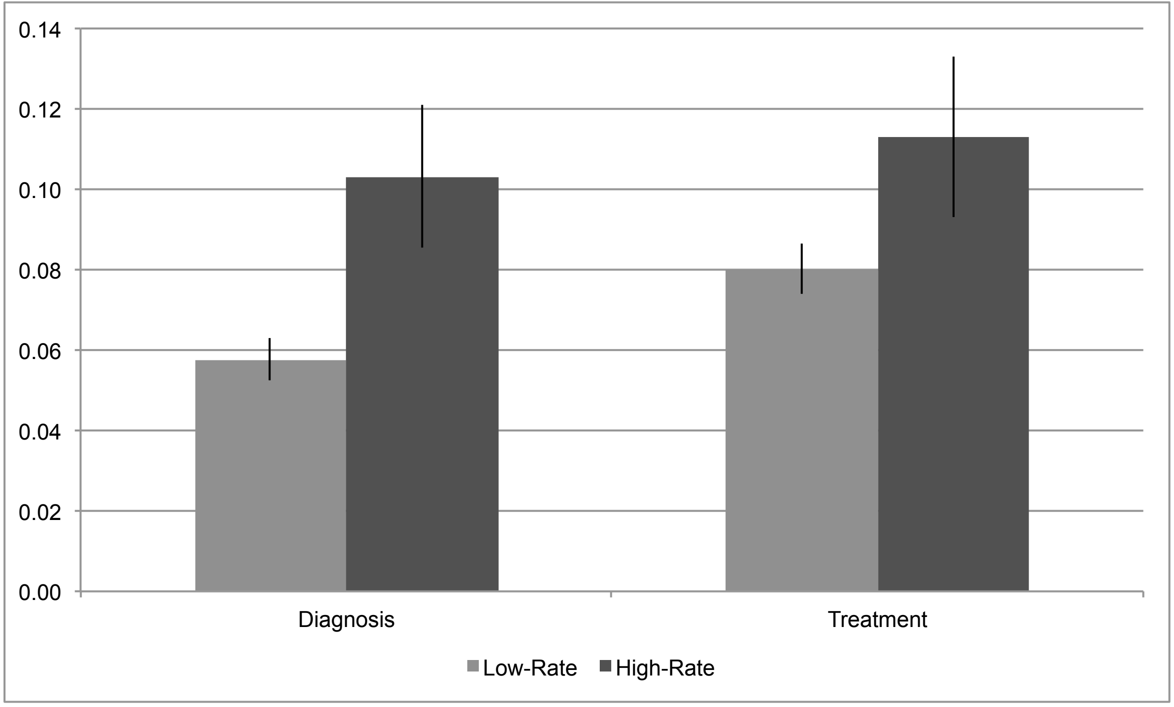
Note: Providers at or above the 95th percentile of screening rates qualify as higher-rate screeners

Table 4.4 Adjusted regression results for depression diagnosis and treatment, comparing visits to providers who screen at higher rates to visits to providers who screen at lower rates

	Depression Diagnosis			**Depression Treatment**		
	OR	**95% CI**	**p-value**	**OR**	**95% CI**	**p-value**
Depression Care						
Depression Screening Rate						
Low	1.00	Ref.	—	1.00	Ref.	—
High	1.96	1.55-2.48	<0.001	1.60	1.22-2.09	0.001
Depression Diagnosis						
No				1.00	Ref.	—
Yes				12.32	8.74-17.36	<0.001
Clinical Characteristics						
Depression Symptoms						
No	1.00	Ref.	—	1.00	Ref.	—
Yes	7.94	5.33-11.85	<0.001	4.30	2.56-7.22	<0.001
Comorbidities						
No	1.00	Ref.	—	1.00	Ref.	—
Yes	1.99	1.45-2.74	<0.001	1.43	1.05-1.96	0.024
Demographics						
Sex						
Male	1.00	Ref.	—	1.00	Ref.	—
Female	1.73	1.19-2.51	0.004	1.08	0.78-1.49	0.634
Age						
12-17	0.48	0.21-1.08	0.077	0.64	0.29-1.39	0.257
18-24	1.00	Ref.	—	1.00	Ref.	—
25-34	1.12	0.64-1.96	0.696	1.78	1.05-3.01	0.033
35-44	1.55	0.85-2.83	0.155	1.47	0.90-2.42	0.126
45-54	0.97	0.55-1.73	0.930	2.12	1.24-3.62	0.006
55-64	0.78	0.44-1.39	0.397	1.24	0.70-2.23	0.462
65+	0.78	0.41-1.50	0.461	0.99	0.48-2.03	0.975
Race/Ethnicity						
White	1.00	Ref.	—	1.00	Ref.	—
Black	0.60	0.35-1.03	0.065	0.58	0.32-1.04	0.067
Hispanic	0.62	0.39-0.98	0.040	0.59	0.38-0.92	0.020
Other	0.35	0.20-0.61	<0.001	0.54	0.28-1.03	0.063
Insurance						
Private	1.00	Ref.	—	1.00	Ref.	—
Medicaid	1.62	0.99-2.65	0.054	0.88	0.55-1.41	0.604
Medicare	2.00	1.27-3.15	0.003	1.15	0.64-2.08	0.632

Self Pay	1.09	0.52-2.27	0.824	0.69	0.36-1.36	0.286
Other	0.99	0.62-1.56	0.952	0.86	0.54-1.39	0.541
Census Region						
North	1.00	Ref.	—	1.00	Ref.	—
Midwest	2.37	1.57-3.58	<0.001	2.00	1.34-2.99	0.001
South	1.72	1.12-2.63	0.012	2.02	1.36-3.02	0.001
West	2.25	1.51-3.37	<0.001	1.41	0.84-2.37	0.191
MSA						
Rural	1.00	Ref.	—	1.00	Ref.	—
Urban	0.92	0.61-1.39	0.693	1.04	0.64-1.68	0.880
Encounter Characteristics						
Patient Status						
Established patient	1.00	Ref.	—	1.00	Ref.	—
New patient	1.12	0.83-1.50	0.462	1.31	1.00-1.72	0.053
Provider Status						
Not the patient's PCP	1.00	Ref.	—	1.00	Ref.	—
Patient's PCP	1.16	0.86-1.57	0.318	1.38	1.01-1.90	0.046
Visit Type						
Acute care	1.00	Ref.	—	1.00	Ref.	—
Preventive care	0.85	0.63-1.14	0.284	1.08	0.84-1.38	0.558
Year	1.03	0.99-1.08	0.162	1.07	1.01-1.13	0.019

Figure 4.2 Regression-adjusted predicted probability of depression diagnosis and treatment, stratified by provider screening rates



Note: All estimates are adjusted for patient sex, age, race/ethnicity, insurance, census region, urban/rural status, any comorbid chronic condition; patient status (new or established); physician status as the patient's primary care provider; visit type (preventive or acute problem); and year. Estimates for treatment are further adjusted for depression diagnosis.

CHAPTER FIVE: CONCLUSION

Summary of Findings

Aim 1 – Examine the impact of the dependent coverage provision (DCP) of the Affordable Care Act on mental health service use and spending among young adults diagnosed with depression and anxiety, including changes in the composition of the population in treatment that may indicate selection effects

Results from this study showed an association between implementation of the DCP and significant increases in the probability of using mental health service among privately insured young adults 19-25 years old with depression and anxiety diagnoses compared to adults 27-33 years old who were not eligible for dependent coverage under the provision. Estimates for the probability of service use ranged from a 9% increase over the baseline rate for outpatient depression or anxiety services overall to a 29% increase over baseline for inpatient depression or anxiety services. The DCP was associated with relatively small increases in the quantity of outpatient mental health services used per person each year. Among young adults who used each service, estimated increases in the number of outpatient depression or anxiety services and psychotherapy services were each equivalent to less than one additional service per person each year among those who used services. With increases in service use, the DCP was associated with considerable increases in average annual total and out-of-pocket spending. Estimates for total and out-of-pocket spending among diagnosed individuals amounted to annual increases of $661 and $80 per person, respectively.

In analyses of new enrollees into private plans, DCP implementation was associated with greater increases in the probability of using mental health services among young adults 19-25 years old with depression and anxiety diagnoses compared to adults 27-33 years old.

Estimates for the probability of service use ranged from an 11% increase over the baseline rate for outpatient depression or anxiety services to a 33% increase over baseline for inpatient depression or anxiety services. Among new enrollees, the quantity of services used per person each year was largely unchanged as a result of DCP implementation; however, a small estimated increase in the number of outpatient depression or anxiety services amounted to less than half of one additional service each year among those who used outpatient services. Spending increases attributable to the DCP were somewhat smaller among new enrollees. Estimates for total and out-of-pocket spending amounted to annual increases of $535 and $60 per person, respectively.

Aim 2 – Examine the association between the Mental Health Parity and Addiction Equity Act (MHPAEA) and mental health service use and spending among young adults diagnosed with depression and anxiety

This study showed an association between the MHPAEA and changes in the probability of using mental health services and the quantity of services used by privately insured adults 26-33 years old with depression and anxiety diagnoses. At the time of implementation, the probability of using inpatient depression or anxiety services increased while the probability of outpatient psychotherapy decreased. In contrast, trends in the probability of inpatient service use decreased after implementation while trends in the probability of outpatient medication management increased. In the first year after the parity law was implemented, changes in the probability of using services translated into small absolute increases in the likelihood of using inpatient (0.2%) and medication management services (1.3%) and a larger absolute decrease in the likelihood of using psychotherapy services (7.8%). With respect to the observed rates of service use in the pre-policy period, the one-year effects represent a 124% increase in the likelihood of using inpatient services, a 34% increase in the likelihood of using medication management, and a 45% decrease in the likelihood of using psychotherapy. In general, the quantity of outpatient services remained steady over the study period; however, among individuals who used outpatient medication management services, the average number of services used per month increased both at the time of implementation and in trends over the period after implementation. The estimated increases were small, cumulatively totaling less than one additional service per medication management user through the end of the study period. In the period after implementation, trends in total spending declined slightly, but no changes in out-of-pocket spending were associated with implementation. The estimated decrease for total spending was too small to equal an overall reduction in the first year after parity implementation, but cumulatively amounted to a decrease of $75 in total spending per person by the end of the study period.

Aim 3 – Examine the correlates of depression care and the association between screening rates and depression diagnosis and treatment among visits by adolescents and adults to outpatient primary care settings

This study showed low overall depression screening rates (3.0%) among initial annual visits to primary care settings, although rates were higher than prior estimates that were not limited to visits with patients who had no visits in the previous year [112, 113]. Higher odds of depression screening were detected for visits with patients whose primary complaints were consistent with depression symptoms. Higher odds of depression diagnosis and treatment were detected for visits in which depression screening was conducted, and the association between screening and the outcomes of interest was stronger for patients with depression symptoms than patients with other reasons for the visit. In analyses of the association between provider screening rates and depression diagnosis and treatment, results showed that visits by demographically and clinically similar patients to providers who screen at higher rates are associated with higher odds of depression diagnosis and treatment compared to visits to providers who screen at lower rates.

Policy Implications

In the second chapter, dependent coverage expansion was associated with significant increases in mental health service use and spending among young adults with depression and anxiety diagnoses; however, the quantity of services used was generally stable among newly enrolled young adults. These findings indicate that while individuals who gained access to coverage after the DCP was implemented had comparable levels of service use as individuals who were treated for depression and anxiety before the policy was implemented, more young adults used services overall. Increased rates of mental health service use could represent depression and anxiety treatment for needs that were unmet prior to dependent coverage expansion since evidence suggests many newly insured young adults were previously uninsured and uninsurance is associated with need for mental health care [15, 16, 18, 20, 24, 62-66, 68, 114, 115]. Alternatively, increased rates of service use could have been driven by disproportionate enrollment of young adults with mental health treatment needs. The first possibility underscores the importance of access to continuous health coverage, while the second explanation signals a role for policy to combat the effects of selection into insurance plans.

The ACA incorporated additional programs and requirements to offset the potential impact of selection effects on insurer spending. The main provision impacting large group insurers like those studied here was implemented incrementally between 2014 and 2016. Known as the “individual mandate”, this provision applied financial penalties to individuals without health insurance in order to encourage healthy people to purchase insurance coverage [79]. Both the effect and the fate of the individual mandate are currently unclear. The individual mandate has been a prominent target for repeal under the legislative agenda of the current administration. Without the mandate, estimates based on similar health reform suggest that enrollment in insurance would drop and spending increases associated with adverse selection could be assumed directly by insurers and indirectly by beneficiaries through higher premiums [116]; however, the cost of adverse selection to insurers and beneficiaries may be lower in employer-sponsored plans than within the health insurance exchanges, where a healthy risk pool has not yet been attained [117].

Some have argued the exchanges have too few healthy young adult enrollees as a direct result of the DCP and proposed reforms that would allow insurers to base premiums on age in a way that would increase costs for older Americans and reduce costs for younger adults to encourage their enrollment [118]. The evidence presented here cannot support or refute claims about the health of young adults who gained access to employer-sponsored insurance as a result of the DCP relative to the remainder of young adults eligible to purchase health coverage on the exchanges; however, the results show that mental health service use and spending increased as a result of the DCP, suggesting young adults who benefited from the DCP were not entirely healthy. Nonetheless, treatment intensity was similar on average before and after the DCP was implemented, which suggests newly enrolled young adults did not have more severe depression and anxiety disorders.

In the third chapter, the federal parity law (MHPAEA) was associated with modest changes in mental health service use among young adults with depression or anxiety diagnoses. In the inpatient setting, the results suggest access to hospital-based care for depression and anxiety might have increased initially. Over time, decreases in trends for inpatient care could indicate that benefit designs deemphasized inpatient care in response to the initial increase or that access to ambulatory services for depression and anxiety increased due to more generous insurance benefits for outpatient care. In the outpatient setting, the results suggest greater and more frequent access to medication management services both at implementation and in trends over time, but an initial drop in the likelihood of using psychotherapy services. This variation in patterns of outpatient service use might be explained partially by differences across the services studied. For example, medication management services might have become more accessible relative to psychotherapy after the parity law was implemented since many psychotherapy providers do not participate in private insurance networks [83]. Comparative changes in generosity of insurance coverage could have led some individuals to choose pharmacotherapy instead of psychotherapy, as both can be effective outpatient treatments for depression and anxiety [4]. Changes in inpatient service use can also be considered relative to therapy. Previous research suggests privately insured individuals with depression might use psychotherapy in the acute phase and rely on medication in the continuation phase [84]. If psychotherapy was less accessible relative to other services as a result of parity requirements, then individuals with less severe disorders might have been more likely to use medication management or other outpatient services while those needing more intense treatment might have been more likely to use inpatient care.

Despite evidence indicating potentially more generous benefits for some mental health services, increased financial protection for enrollees was not observed. Trends in total mental health spending decreased while out-of-pocket spending was unchanged, which could suggest that one of the primary goals of the parity law might not have been realized in this population. Alternatively, the minor spending change could suggest that cost sharing or treatment limitations for depression and anxiety services were mostly compatible with parity requirements prior to implementation of the parity law. In that case, parity compliance might have been achieved through minor modifications that resulted in small shifts in service use without significantly impacting spending. Additionally, the availability of lower cost and lower intensity treatment for depression and anxiety compared to other mental illnesses might obscure spending changes shown in prior research on groups with more complex and treatment-intensive disorders [36, 37].

Altogether, the results emphasize the potential influence of service availability and accessibility on treatment options used by adults with private insurance. From the payer perspective, substituting medication management for psychotherapy might result in savings, but substituting inpatient treatment of more severe disorders for psychotherapy could lead to large spending increases that outweigh outpatient savings. For federal parity to successfully increase access to care among enrollees with common mental illnesses without driving up spending, it could be critical to consider policies and programs to facilitate more efficient service use by improving the effective availability of a range of treatments. For example, psychiatrist participation rates in health insurance could be improved by raising reimbursement or implementing alternative payment models, as with the recent growth in team-based approaches to care [119].

In the fourth chapter, depression screening was uncommon in primary care settings, but patterns of depression care suggest screening practices were concentrated on higher risk patients. This difference could demonstrate targeted screening practices of physicians confirming a diagnosis in patients they suspect might have depression. Assuming patients who report depression symptoms are more likely to have depression, observing higher diagnosis rates in this group could be expected; however, results show the association between depression symptom reporting and diagnosis depends on screening. This finding could reflect the better predictive accuracy of a given depression screener when applied to groups with higher prevalence. The finding could also indicate that depression is overlooked in the absence of screening, despite patient reports of symptoms consistent with depression. The first explanation suggests targeted screening practices could be appropriate in typical primary care settings where time and resources are limited, while the latter highlights the potential importance of increasing screening rates. Indeed, the evidence presented here suggests modest increases in average screening rates might lead to higher rates of depression identification and treatment.

During the 10-year period studied, the USPSTF recommendations supported depression screening on an individual basis considering patient risk factors and clinical resources unless primary care practices included staff and other supports to assist depression diagnosis and treatment under a routine screening protocol [95, 120]. These distinctions were removed from recent revisions to the recommendations, which supported routine screening for all adolescents and adults in primary care [91]. Far from universal, the screening rates and relationships in this study suggest more research may be needed to understand which aspects of representative primary care settings are associated with higher screening rates. Together with more research on the relationship between screening and both depression care processes and patient outcomes, a greater understanding of contextual variation may help improve alignment between recommendations and evidence-based practices aimed at reducing the prevalence of depression in primary care.

Priorities for Future Research

National Insurance Reforms

To understand the comprehensive effects associated with the DCP and MHPAEA policies, continued study over time is needed. The research presented here and the published literature on each policy analyzed data from 2013 or earlier, but important developments occurred later. As the individual mandate of the ACA imposed fees for being uninsured that surpassed the cost of insurance, healthier young adults might have been better represented in the private insurance pool [12]. Regardless of the future status of the individual mandate, opportunities to research the association between dependent coverage expansion and selection into insurance remain. Preliminary studies could examine effects from the early partial implementation of the individual mandate and the first year the full penalties applied. In addition, evidence is needed for selection into individual and small group plans.

Individual and small group insurers face more uncertainty in relation to selection effects than large group insurers due to their smaller enrollee pools. Considering this potential disadvantage, the ACA incorporated programs and requirements to offset the financial impact of possible selection effects for insurers in the individual and small group markets [121, 122]. Implemented in 2014 and concluding at the end of 2016 when the individual mandate fully applied, these policies might be associated with changes in insurance costs. Finally, it is important to assess whether increased rates of service use diminish over time as the DCP functions less as a new option for young adults to obtain coverage than as a means for them to maintain coverage during a period associated with higher risk of losing access to insurance.

Additional changes in 2014 include the application of parity requirements to nearly all individual and small group insurance plans, many of which formerly excluded mental health and substance use disorder benefits altogether [123]. Individual and small group insurers face distinct financial and regulatory pressures, including variation in the state laws governing fully insured health plans in general and specific differences in their mental health parity requirements [124]. Future studies examining the relationship between the federal parity law and mental health service use and spending within individual and small group plans or across insurance categories could reveal important similarities and differences in the effect of parity implementation compared to changes that have been described in the literature on large group plans.

Studies of the relationship between national insurance reform and mental health care among groups with severe and persistent mental illnesses are also needed. Chronic and disabling mental disorders also have more predictable courses and treatment needs than the often transient disorders studied here, which amplifies the potential for adverse selection into insurance plans [67]. Therefore, the mechanisms by which the DCP potentially impacted mental health service use and spending among individuals diagnosed with severe and persistent mental illnesses could contrast with the evidence presented here. While serious mental illnesses affect considerably fewer people than less serious disorders, the cost of treating them may be higher, which could have important implications for the financial risk assumed by insurers and enrollees as a result of the DCP [125, 126].

Some previous studies of federal parity have focused both on people with high intensity service use indicating more serious mental problems and on children with autism, a developmental disorder that commonly requires intensive and prolonged care [34, 36]; however, research to date has not explicitly explored the association between the MHPAEA and mental health care among groups with severe and persistent mental illnesses, such as bipolar disorders. Until recently, studying the effect of federal parity within these groups was possibly constrained by small sample sizes considering severe mental illnesses are uncommon and individuals with severe mental illnesses were underrepresented in the private plans targeted by the parity law [127]. The extension of parity requirements in 2014, particularly to Medicaid expansion plans, enabled many vulnerable individuals with severe mental illness to obtain insurance with mental health benefits subject to the parity law [128]. Given that treatment of severe mental illnesses shapes mental health care spending, the potential influence of parity on service use and spending in these groups has widespread consequences.

Depression Screening in Primary Care Settings

Opponents of universally screening adolescents and adults in primary care criticize the USPSTF recommendations based on insufficient evidence, specifically citing that no randomized control trials have assessed whether depression screening leads to lower prevalence rates [54]. This point is reasonable considering the USPSTF issues national recommendations upon which health policies are frequently based. Nonetheless, a better understanding of the relationships between screening and outcomes that are intermediate to depression remission may be needed in order to establish the linkage between depression screening and reduced prevalence. Identifying depression is important for treatment, and treatment that aligns with guidelines for both initiation and continuation is critical to achieve remission [41]. The research presented here suggests screening has an important role in identifying and treating depression in primary care, but future studies could examine this pathway over time in order to formally assess whether diagnosis and treatment mediate the relationship between depression screening and patient outcomes.

In addition, research focusing explicitly on the association between contextual factors and the depression care pathway in general medical settings is needed. Current evidence demonstrating successful depression treatment in general medical settings largely originates from clinical trials testing care coordination and collaboration models to integrate mental health into primary care [44]. Heterogeneity in the results of this research indicate the potential role of contextual effects, but less is known about depression treatment in primary care outside the framework of large-scale trials [44]. In particular, research is needed on the structure and organization of representative primary care practices and the availability and distribution of resources.

Studying representative settings could facilitate the identification of common systems or processes that are conducive to implementing standardized elements of models for treating depression in primary care. For example, a recent study examined the association between depression screening and the adoption of electronic health record (EHR) systems in primary care, including utilization of specific EHR features [57]. Studies of EHR systems could be extended to diagnosis, treatment, and health outcomes. Corresponding studies of the systems used in settings without EHR could illuminate similar relationships between depression care and specific routines, such as using problem lists for patients [57]. In addition to standardization, analyzing variation in environments and resources across conventional settings could expose organizational and operational features suitable for customized strategies to address depression primary care.

Providers and staff can serve as key informants for designing and executing studies of the structural aspects of primary care practices that are related to depression management [129]. Some data collection tools have been developed to assess organizational features of primary care practice, but they vary widely in terms of their measures, target populations, and validation [130]. A small minority of these tools explicitly address mental health care, and most were created and used in localized settings [130]. Surveys or interviews of primary care providers in representative settings could reveal relationships that generalize to typical primary care practices. Finally, incorporating the training, experience, and opinions of providers into surveys and interviews could illuminate the perceived benefits and barriers associated with depression treatment in primary care settings.

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Appendix A

Supplemental Table A-1. Baseline characteristics of young adults with depression and anxiety diagnoses before the DCP was implemented, stratified by sensitivity analysis

	Narrow Sample				Beneficiary Sample			
	23-25 years old		27-29 years old		19-25 dependent		19-25 primary	
	N	%	N	%	N	%	N	%
	48,438		74,687		66,465		53,533	
Sex								
Female	34,118	70.4	52,397	70.2	41,798	62.9	38,971	72.8
Census Region								
Northeast	7,820	16.1	11,399	15.3	9,845	14.8	8,830	16.5
Midwest	12,562	25.9	18,780	25.1	19,924	30.0	12,407	23.2
South	17,793	36.7	28,531	38.2	19,607	29.5	20,527	38.3
West	10,263	21.2	15,977	21.4	17,089	25.7	11,769	22.0
Urban/rural								
MSA	42,712	88.2	65,964	88.3	59,224	89.1	46,868	87.5
Diagnoses								
Depression alone	21,602	44.6	34,377	46.0	31,781	47.8	23,710	44.3
Anxiety alone	20,117	41.5	30,311	40.6	25,832	38.9	22,524	42.1
Depression and anxiety	6,719	13.9	9,999	13.4	8,852	13.3	7,299	13.6
Comorbidities								
Any mental illness	10,195	21.0	14,929	20.0	17,838	26.8	10,414	19.5
Bipolar disorder	2,445	5.0	3,291	4.4	4,468	6.7	2,384	4.5
Substance use disorder	1,975	4.1	2,615	3.5	4,983	7.5	1,851	3.5
Service use								
Any inpatient depression or anxiety service use	990	2.0	1,379	1.8	2,156	3.2	1,127	2.1
Any outpatient depression or anxiety service use	48,209	99.5	74,383	99.6	65,913	99.2	53,295	99.6
Average depression or anxiety services per year among users	5.99		6.02		6.12		5.48	
Any outpatient psychotherapy service use	19,815	40.9	31,803	42.6	31,741	47.8	19,653	36.7
Average psychotherapy services per year among users	9.39		9.40		9.18		8.49	
Any outpatient medication management service use	6,707	13.8	9,723	13.0	11,903	17.9	6,219	11.6
Average medication management services per year among users	3.48		3.48		3.39		3.31	
Any psychotropic medication use	33,820	69.8	52,625	70.5	46,336	69.7	36,513	68.2

Supplemental Table A-2. Estimated effects of the DCP on mental health service use and spending among young adults with depression and anxiety diagnoses, stratified by sensitivity analysis

Narrow Sample	23-25 years old				27-29 years old						
	Pre-DCP		Post-DCP		Pre-DCP		Post-DCP				
Probability of service use	**%[b]**	**95% CI**	**%**	**95% CI**	**%**	**95% CI**	**%**	**95% CI**	**DD[a]**	**95% CI**	**p**
Inpatient or Outpatient Depression or Anxiety	6.59	6.50-6.68	8.14	8.05-8.22	7.04	6.97-7.11	7.79	7.68-7.90	0.80	0.68-0.92	<0.001
Inpatient Depression or Anxiety	0.11	0.10-0.12	0.18	0.17-0.20	0.13	0.12-0.14	0.16	0.15-0.18	0.04	0.02-0.06	<0.001
Outpatient Depression or Anxiety	6.57	6.48-6.66	8.10	8.02-8.19	7.02	6.95-7.09	7.76	7.65-7.87	0.80	0.67-0.92	<0.001
Psychotherapy	2.82	2.76-2.88	3.58	3.52-3.63	3.11	3.06-3.15	3.23	3.16-3.30	0.64	0.55-0.72	<0.001
Medication management	0.92	0.88-0.95	1.11	1.07-1.14	1.07	1.04-1.10	1.00	0.96-1.05	0.26	0.21-0.30	<0.001
Intensity of outpatient service use among users	**N[c]**	**95% CI**	**N**	**95% CI**	**N**	**95% CI**	**N**	**95% CI**	**DD**	**95% CI**	**p**
Depression or anxiety	6.34	6.21-6.48	7.32	7.18-7.46	6.30	6.21-6.39	6.83	6.70-6.96	0.45	0.28-0.61	<0.001
Psychotherapy	9.73	9.47-9.98	10.87	10.63-11.10	9.78	9.62-9.95	10.54	10.29-10.78	0.39	0.09-0.69	0.013
Medication management	3.57	3.45-3.69	3.56	3.47-3.66	3.54	3.45-3.62	3.52	3.40-3.63	0.02	-0.12-0.15	0.821
Mental Health Spending	**$[d]**	**95% CI**	**$**	**95% CI**	**$**	**95% CI**	**$**	**95% CI**	**DD**	**95% CI**	**p**
Total	1,697	1,631-1,763	2,470	2,382-2,559	1,828	1,778-1,877	1,923	1,846-2,000	678	577-778	<0.001
Out-of-pocket	328	318-337	422	412-433	353	345-361	368	358-377	80	68-92	<0.001
Beneficiary Sample	**19-25 Dependents**				**19-25 Primary**						
	Pre-DCP		**Post-DCP**		**Pre-DCP**		**Post-DCP**				
Probability of service use	**%[b]**	**95% CI**	**%**	**95% CI**	**%**	**95% CI**	**%**	**95% CI**	**DD[a]**	**95% CI**	**p**
Inpatient or Outpatient Depression or Anxiety	6.59	6.53-6.65	8.21	8.16-8.25	5.43	5.38-5.48	6.15	6.09-6.22	0.89	0.79-0.98	<0.001
Inpatient Depression or Anxiety	0.17	0.17-0.18	0.28	0.27-0.28	0.11	0.11-0.12	0.13	0.12-0.14	0.09	0.07-0.10	<0.001
Outpatient Depression or Anxiety	6.56	6.50-6.62	8.16	8.12-8.21	5.41	5.36-5.46	6.13	6.07-6.20	0.88	0.78-0.97	<0.001
Psychotherapy	3.41	3.36-3.45	3.91	3.87-3.94	2.02	1.99-2.05	2.28	2.24-2.32	0.24	0.18-0.31	0.117
Medication management	1.37	1.34-1.40	1.39	1.37-1.41	0.66	0.64-0.68	0.65	0.63-0.67	0.03	-0.01-0.07	0.214
Intensity of outpatient service use among users	**N[c]**	**95% CI**	**N**	**95% CI**	**N**	**95% CI**	**N**	**95% CI**	**DD**	**95% CI**	**p**
Depression or anxiety	6.86	6.77-6.94	7.54	7.47-7.62	5.43	5.36-5.50	6.02	5.92-6.12	0.10	-0.05-0.25	0.530
Psychotherapy	10.28	10.13-10.43	10.93	10.81-11.06	8.01	7.87-8.16	8.63	8.44-8.82	0.04	-0.23-0.32	0.433
Medication management	3.59	3.52-3.65	3.52	3.47-3.57	3.24	3.17-3.32	3.15	3.07-3.23	0.03	-0.09-0.15	0.569
Mental Health Spending	**$[d]**	**95% CI**	**$**	**95% CI**	**$**	**95% CI**	**$**	**95% CI**	**DD**	**95% CI**	**p**
Total	2,819	2,747-2,891	3,401	3,337-3,466	1,423	1,389-1,458	1,511	1,462-1,561	494	392-596	<0.001
Out-of-pocket	427	419-435	510	503-516	293	288-298	324	318-331	51	39-62	<0.001

[a] Difference-in-differences are regression-adjusted predictions of the interaction between age group and policy period

[b] Values are regression-adjusted predictions of percentage who used services
[c] Values are regression-adjusted predictions of average services used per person per year among individuals who used services
[d] Values are regression-adjusted predictions of average dollars per person per year

Note: All regressions adjust for sex, age, census region, MSA status, age group, year, and policy period

Appendix B

Supplemental Table B-1. Characteristics of newly enrolled young adults with depression and anxiety diagnoses before the DCP was implemented, stratified by sensitivity analysis

	Narrow Sample				**Beneficiary Sample**			
	23-25 years old		**27-29 years old**		**19-25 dependent**		**19-25 primary**	
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**
	33,355		48,347		50,090		41,001	
Sex								
Female	23,727	71.1	34,032	70.4	31,710	63.3	30,002	73.2
Census Region								
Northeast	5,596	16.8	7,769	16.1	7,823	15.6	6,952	17.0
Midwest	8,409	25.2	12,054	24.9	14,771	29.5	9,593	23.4
South	12,263	36.8	18,319	37.9	14,915	29.8	15,517	37.8
West	7,087	21.2	10,205	21.1	12,581	25.1	8,939	21.8
Urban/rural								
MSA	29,565	88.6	43,005	89.0	44,725	89.3	36,070	88.0
Diagnoses								
Depression alone	14,970	44.9	22,689	46.9	24,573	49.1	18,337	44.7
Anxiety alone	13,629	40.9	18,949	39.2	18,616	37.2	16,889	41.2
Depression and anxiety	4,756	14.3	6,709	13.9	6,901	13.8	5,775	14.1
Comorbidities								
Any mental illness	6,939	20.8	9,657	20.0	13,562	27.1	8,088	19.7
Bipolar disorder	1,725	5.2	2,267	4.7	3,609	7.2	1,975	4.8
Substance use disorder	1,311	3.9	1,745	3.6	3,796	7.6	1,442	3.5
Service use								
Any inpatient depression or anxiety service use	638	1.9	792	1.6	1,427	2.8	787	1.9
Any outpatient depression or anxiety service use	33,204	99.5	48,141	99.6	49,692	99.2	40,812	99.5
Average depression or anxiety services per year among users	6.17		6.36		6.48		5.71	
Any outpatient psychotherapy service use	13,933	41.8	21,572	44.6	25,168	50.2	15,615	38.1
Average psychotherapy services per year among users	9.57		9.74		9.52		8.81	
Any outpatient medication management service use	4,906	14.7	7,062	14.6	10,011	20.0	5,259	12.8
Average medication management services per year among users	3.49		3.54		3.43		3.37	
Any psychotropic medication use	23,191	69.5	33,990	70.3	34,794	69.5	27,889	68.0

Supplemental Table B-2. Estimated effects of the DCP on mental health service use and spending among newly enrolled young adults with depression and anxiety diagnoses, stratified by sensitivity analysis

Narrow Sample	**23-25 years old**				**27-29 years old**						
	Pre-DCP		**Post-DCP**		**Pre-DCP**		**Post-DCP**				
Probability of service use	**%[b]**	**95% CI**	**%**	**95% CI**	**%**	**95% CI**	**%**	**95% CI**	**DD[a]**	**95% CI**	**p**
Inpatient or Outpatient Depression or Anxiety	6.42	6.30-6.54	7.89	7.75-8.02	6.83	6.74-6.92	7.60	7.46-7.74	0.70	0.54-0.86	<0.001
Inpatient Depression or Anxiety	0.11	0.10-0.12	0.18	0.16-0.20	0.12	0.11-0.14	0.17	0.14-0.19	0.03	0.00-0.06	0.008
Outpatient Depression or Anxiety	6.39	6.28-6.51	7.85	7.72-7.98	6.81	6.72-6.91	7.57	7.43-7.71	0.70	0.54-0.86	<0.001
Psychotherapy	2.78	2.70-2.86	3.21	3.12-3.30	2.98	2.91-3.04	3.00	2.92-3.09	0.40	0.30-0.51	<0.001
Medication management	0.92	0.88-0.97	0.99	0.94-1.03	1.02	0.98-1.06	0.93	0.88-0.98	0.15	0.09-0.21	<0.001
Intensity of outpatient service use among users	**N[c]**	**95% CI**	**N**	**95% CI**	**N**	**95% CI**	**N**	**95% CI**	**DD**	**95% CI**	**p**
Depression or anxiety	6.28	6.11-6.46	6.98	6.79-7.16	6.27	6.15-6.39	6.98	6.77-7.18	-0.01	-0.24-0.22	0.901
Psychotherapy	9.59	9.26-9.91	10.23	9.88-10.57	9.74	9.50-9.97	10.74	10.37-11.12	-0.37	-0.79-0.06	0.114
Medication management	3.45	3.30-3.61	3.35	3.20-3.50	3.56	3.44-3.68	3.44	3.27-3.60	0.02	-0.17-0.21	0.860
Mental Health Spending	**$[d]**	**95% CI**	**$**	**95% CI**	**$**	**95% CI**	**$**	**95% CI**	**DD**	**95% CI**	**p**
Total	1,653	1,575-1,731	2,303	2,178-2,428	1,779	1,713-1,844	1,923	1,821-2,025	506	368-643	<0.001
Out-of-pocket	332	321-344	430	415-445	354	345-364	399	385-414	53	35-71	<0.001
Beneficiary Sample	**19-25 Dependents**				**19-25 Primary**						
	Pre-DCP		**Post-DCP**		**Pre-DCP**		**Post-DCP**				
Probability of service use	**%[b]**	**95% CI**	**%**	**95% CI**	**%**	**95% CI**	**%**	**95% CI**	**DD[a]**	**95% CI**	**p**
Inpatient or Outpatient Depression or Anxiety	6.49	6.43-6.56	8.26	8.19-8.32	5.22	5.16-5.27	5.66	5.58-5.74	1.32	1.20-1.44	<0.001
Inpatient Depression or Anxiety	0.18	0.17-0.19	0.31	0.30-0.33	0.11	0.10-0.11	0.12	0.11-0.13	0.12	0.10-0.15	<0.001
Outpatient Depression or Anxiety	6.46	6.40-6.53	8.21	8.14-8.28	5.20	5.14-5.25	5.64	5.56-5.72	1.30	1.18-1.42	<0.001
Psychotherapy	3.31	3.26-3.35	3.72	3.68-3.77	1.97	1.94-2.00	2.04	1.99-2.08	0.35	0.27-0.43	<0.001
Medication management	1.33	1.30-1.36	1.33	1.31-1.36	0.66	0.64-0.68	0.60	0.58-0.63	0.06	0.01-0.11	0.002
Intensity of outpatient service use among users	**N[c]**	**95% CI**	**N**	**95% CI**	**N**	**95% CI**	**N**	**95% CI**	**DD**	**95% CI**	**p**
Depression or anxiety	6.78	6.68-6.88	7.35	7.24-7.45	5.40	5.32-5.48	5.88	5.75-6.01	0.08	-0.10-0.27	0.727
Psychotherapy	10.12	9.95-10.29	10.39	10.22-10.57	8.00	7.84-8.17	8.52	8.27-8.78	-0.25	-0.60-0.09	0.060
Medication management	3.51	3.44-3.58	3.38	3.29-3.47	3.23	3.14-3.32	3.08	2.96-3.19	0.02	-0.14-0.18	0.666
Mental Health Spending	**$[d]**	**95% CI**	**$**	**95% CI**	**$**	**95% CI**	**$**	**95% CI**	**DD**	**95% CI**	**p**
Total	2,714	2,636-2,792	3,321	3,233-3,409	1,420	1,378-1,461	1,517	1,440-1,595	509	376-643	<0.001
Out-of-pocket	434	425-433	532	521-542	291	285-297	329	320-339	60	44-76	<0.001

[a] Difference-in-differences are regression-adjusted predictions of the interaction between age group and policy period

[b] Values are regression-adjusted predictions of percentage who used services
[c] Values are regression-adjusted predictions of average services used per person per year among individuals who used services
[d] Values are regression-adjusted predictions of average dollars per person per year
Note: All regressions adjust for sex, age, census region, MSA status, age group, year, and policy period

Curriculum Vitae

Hillary Samples, MHS
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Education

PhD Candidate, Health Services Research and Policy	2017
Certificate of Bioethics and Public Health Policy	2015
Master of Health Science, Department of Mental Health	2013

Johns Hopkins University School of Public Health

Bachelor of Arts, double major in Psychology and Spanish, minor in Biology	2007

University of Virginia

Fellowships and Awards

• Marilyn Bergner Award in Health Services Research	2016 – 2017
• June Culley Doctoral Scholarship in Health Policy and Management	2015 – 2016
• National Research Service Award Fellowship, T32HS000029	2013 – 2016

Research Experience

Research Assistant 2016 – 2017
Brendan Saloner, PhD, Johns Hopkins University School of Public Health

- Analyzed nationally representative survey data and authored a manuscript assessing tobacco screening and counseling for smokers with behavioral health disorders

Research Assistant 2013 – 2017
Colleen Barry, PhD, MPP, Johns Hopkins University School of Public Health
Funded by the National Institute of Mental Health, MH093414

- Analyzed insurance claims and collaborated on a manuscript evaluating the Mental Health Parity and Addiction Equity Act effect on mental health service use and spending
- Reviewed state health insurance exchange types and insurance plan summaries to compare behavioral health with medical benefits
- Assessed employer insurance plan adoption for a grant submission

Research Assistant 2014 – 2016
Emma McGinty, PhD, MS, Johns Hopkins University School of Public Health

- Collaborated to create and refine an instrument to code news media content, and reviewed print and television coverage of recreational marijuana legalization
- Collaborated on a manuscript assessing public discourse of recreational marijuana legalization and regulation

Research Assistant 2014 – 2015

Ruth Faden, PhD, MPH, Johns Hopkins Berman Institute of Bioethics

Funded by the National Institutes of Health, AI108368

- Reviewed literature and collaborated on a grant submission for renewed project funding
- Coordinated and synthesized materials for stakeholder meetings regarding ethical and legal issues related to advancing research on HIV prevention and treatment for pregnant women

Research Assistant 2014 – 2015

Gail Daumit, MD, MHA, Johns Hopkins University School of Medicine

Funded by the National Institute of Mental Health, MH102822

- Reviewed literature and collaborated to create survey and interview instruments for behavioral health home leaders that evaluated integration and collaboration in accordance with AHRQ parameters

Research Fellow 2014

Presidential Commission for the Study of Bioethical Issues, U.S. Department of Health and Human Services

- Researched, reviewed, and synthesized literature to author detailed memoranda related to commission projects, including *Gray Matters: Integrative Approaches for Neuroscience, Ethics, and Society.*
- Compiled, organized, and analyzed data to present to staff related to commission projects, including *Moral Science: Protecting Participants in Human Subjects Research*

Research Program Coordinator 2013

Holly Taylor, PhD, MPH, Johns Hopkins Berman Institute of Bioethics

- Managed and coordinated a prospective, mixed methods study
- Collaborated to develop a sampling frame
- Disseminated and monitored survey participation
- Collected and coded data, created and maintained qualitative and quantitative databases, and analyzed data
- Developed manuscript materials, prepared progress reports, and organized study team meetings

Consultant, Clinical Research Coordination 2012 – 2013

University of Virginia School of Medicine

- Advised study investigators, research coordinators, and research assistants regarding clinical research to ensure proper procedure and documentation of study operations

Certified Clinical Research Coordinator 2011 – 2012

University of Virginia School of Medicine

- Managed regulatory documents and files, including grants and contracts, IRB submissions, budgets, and reports within established institutional, state, and federal guidelines and regulations
- Developed research materials, such as advertisements, brochures, questionnaires,

assessment protocols, training manuals and tutorials, and report forms

- Facilitated informed consent and study procedures, ensuring proper protocol for recruitment, scheduling, screening, and enrolling participants
- Developed and maintained databases; managed data collection, analysis, and reporting
- Supervised research staff training, including assistants and satellite site personnel
- Liaised among investigators, research staff, and review boards at all study sites
- Collaborated to review literature and develop research posters, presentations, and manuscripts

Research Assistant 2010 – 2012
Radio or Open Surgery for Epilepsy Trial, University of Virginia Health System IRB-HSR# 14807

- Administered and scored neuropsychological tests for English and Spanish-speaking participants
- Developed and disseminated educational training materials at international sites
- Managed HIPAA-compliant data storage and reporting

Clinical Research Coordinator 2008 – 2011
University of Virginia Health System

- Independently and collaboratively reviewed relevant literature to design study protocols
- Synthesized materials from multi-site trial sponsors to develop study documents, including IRB applications, site-specific protocols and consent forms, grants and contracts, advertisements, brochures, questionnaires, data sheets, and other report forms
- Liaised among study sponsors, investigators, personnel, and oversight bodies to ensure controlled study operations and documentation in accordance with relevant regulations
- Oriented incoming investigators to study practices and goals
- Supervised research assistants regarding study procedure, test administration and scoring, data storage and reporting, and record keeping
- Facilitated informed consent and administered study treatment
- Managed HIPAA-compliant data collection, storage, and distribution, including the development and maintenance of a database of approximately 7,000 study participants
- Performed data analysis to independently and collaboratively author research publications and presentations and manage manuscript submission and revision

Instructional Experience

Teaching Assistant
Johns Hopkins University School of Public Health

- The Research and Proposal Writing Process 2015 – 2016
- Research Ethics and Integrity: U.S. and International Issues 2015 – 2016
- Introduction to Bioethics in Public Health Practice and Research 2013 – 2016
- Assessing Health Status and Patient Reported Outcomes 2015
- Urban Policy 2015
- Ethical Issues in Health Policy: Public Health and Health Care 2014

Professional Experience

Certified Specialist in Psychometry 2007 – 2011

University of Virginia Health System

- Administered neuropsychological tests evaluating cognitive, academic, behavioral and emotional functional status of patients
- Composed detailed observations related to assessment validity, including patient affect, behavior, comprehension, attention/concentration, work habits, problem solving, and effort/perseverance
- Collaborated to create and adapt test batteries for the clinical referral question and patient needs
- Acclimated entering fellows, residents, and practicum students to the psychometrist position
- Managed billing and data sheets, software scoring programs, and test materials and supplies
- Provided outstanding patient care, including punctuality, patience, and professionalism

Professional Affiliations

- Academy Health, Behavioral Health Services Research Interest Group
- American Statistical Association

Publications

- McGinty, E., **Samples, H.**, Bandara, S., Saloner, B., Bachhuber, M., & Barry, C. (2016). The Emerging Public Discourse on State Legalization of Marijuana for Recreational Use in the US: Analysis of News Media Coverage, 2010-2014. *Preventive Medicine, 90,* 114-120.
- **Samples, H.** & Mojtabai, R. (2015). Antidepressant Self-discontinuation: Results from the Collaborative Psychiatric Epidemiology Surveys. *Psychiatric Services, 66(5),* 455-462.
- **Samples, H.** & Mojtabai, R. (2013). Perceived Indications and Patterns of Antidepressant Use in the European Union. *Psychiatric Services, 64(3)*, 208.
- Broshek, D., **Samples, H.**, Beard, J., & Goodkin, H. (2012). Current Practices of the Child Neurologist in Managing Sports Concussion. *Journal of Child Neurology, 29(1),* 17-22.
- Chen, S., Barth, A., Barth, J., Bennett, B., Brandt-Pearce, M., Broshek, D., Freeman, J., **Samples, H.**, Lach, J. (2012). Aiding Diagnosis of Normal Pressure Hydrocephalus with Enhanced Gait Feature Separability. *Proceedings: Wireless Health, 3.*
- Barth, J., Trudel, T., Nidiffer, F., & **Samples, H.** (Eds.) (2012). *TBI rehabilitation, return to duty, and community re-entry: A military modular intervention program.* Defense and Veterans Brain Injury Center: Charlottesville Rehabilitation Programs, Virginia.
- Bailey, C., **Samples, H.**, Broshek, D., Barth, J., & Freeman, J. (2010). The Relationship between Psychological Distress and Baseline Sports-related Concussion Testing. *Clinical Journal of Sports Medicine, 20(4),* 272-277.

Manuscripts in Review

- **Samples, H.**, Bandara, S., & Saloner, B. (In Review). Tobacco Screening and Counseling for Smokers with Mental Health and Substance Use Disorders in a National Sample.
- Huskamp, H., **Samples, H.**, Hadland, S., McGinty, E., Gibson, T., Goldman, H., Busch, S., Stuart, E., & Barry, C. (In Review). Mental Health Spending and Intensity of Service Use following Federal Parity for Individuals Diagnosed with Eating Disorders.

Presentations

- Broshek, D., Samples, H., Beard, J., & Goodkin, H. (2011). Current Practices of the Pediatric Neurologist in the Management of Sports Concussion. Poster presented at the 40th annual meeting of the Child Neurology Society, Savannah, GA.
- Sanders, J., Samples, H., Bailey, C., Cuttita, K., Broshek, D., Freeman, J., Barth, J. (2010). Differences in Preseason Baseline Functioning & Cognitive Efficiency of Athletes Diagnosed with ADHD/LD and Controls. Poster presented at the University of Virginia Research Day, Charlottesville, VA.
- Sanders, J., Samples, H., Bailey, C., Broshek, D., Freeman, J., & Barth, J. (2010). The Effects of Attention Deficit Hyperactivity Disorder and Learning Disability on Baseline Neurocognitive Performance in Athletes. Poster presented at the 8th annual conference of the American Academy of Clinical Neuropsychology, Chicago, IL.
- Bailey, C., Samples, H., Broshek, D., Barth, J., & Freeman, J. (2009). The Influence of Psychological Symptoms on Baseline Concussion Testing. Poster presented at the Annual Conference of the National Academy of Neuropsychology, New Orleans, LA.