

EXAMINING THE EFFECT OF THE AFFORDABLE CARE ACT'S DEPENDENT
COVERAGE PROVISION ON ACCESS AND UTILIZATION OF BEHAVIORAL
HEALTH TREATMENT: AN URBAN RURAL COMPARISON

A Dissertation

by

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ABSTRACT

In September 2010, an early provision of the Affordable Care Act (ACA) enabled young adults to remain on their parents' private insurance plans as dependents until the age of 26. The dependent coverage provision (DCP) may have been especially advantageous for rural residents, who have worse insurance coverage and poorer access to health care compared to their urban counterparts. While the DCP expanded insurance coverage and increased healthcare utilization among young adults, its impact on rural residents remains unclear.

Study one provides a comprehensive literature review of prior research on the impact of the DCP on young adult's access to and utilization of health care. Studies so far suggest that the DCP increased young adult's private insurance coverage, access to a usual source of care, and reduced health care costs. The DCP also increased utilization of some health services, including mental health and dental care. However, the DCP's impact on other health services such as emergency department visits and hospital stays remains unclear. Notably, very few studies have explored the DCP's impact on disparities in access to and utilization of health care among rural and underserved populations.

The second study used a quasi-experimental approach to compare pre-post DCP changes in access to and utilization of mental health treatment among rural versus urban dwelling young adults (ages 19-25 years versus 26-34 years), using data from the 2007-2014 National Survey on Drug Use and Health. Findings indicated that the magnitude of

the DCPs impact on utilization of mental health treatment services among rural young adults was nearly double those of urban young adults (8.77% versus 3.97%). Compared to urban residents, rural young adults experienced greater gains in insurance coverage and were also more likely to use their newly acquired insurance to pay for their mental health treatment. Cost-related barriers to mental health care also declined significantly by 16.77% in rural young adults following the DCP, while urban residents experienced no effect.

Similar to study two, the final study used a quasi-experimental approach to estimate the DCP's effect on access to and utilization of substance use disorder (SUD) treatment services among rural versus urban young adults (ages 19-25 years versus 26-34 years), using data from the 2007-2014 National Survey on Drug Use and Health. While results indicated that both rural and urban experienced gains in private insurance coverage and decreases in financial barriers to care following the DCP, we found no evidence of corresponding increases in SUD treatment utilization. Findings did provide evidence that newly insured rural residents were able to use their private insurance to cover treatment costs, which appeared to impact the setting at which rural residents receive SUD treatment.

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NOMENCLATURE

ACA	Affordable Care Act
DCP	Dependent Coverage Provision
NSDUH	National Survey on Drug Use and Health
SPD	Serious Psychological Distress
SUD	Substance Use Disorder

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CHAPTER I

INTRODUCTION

Although young adulthood is generally a period of good physical health, some important health and social problems either start or peak during these years. Compared to other age groups, age young adults have the highest rate of death and injury from motor vehicles, homicides, sexually transmitted infections (STIs), mental health problems, and substance abuse.¹ While many of these health problems can be prevented or managed with access to appropriate care, young adults frequently delay or forgo needed care due to lack of insurance coverage.² Health insurance coverage rates for young adults have historically been the lowest of any age group, and lack of health insurance is one of the most significant barriers to health care among this population.²

The Affordable Care Act (ACA) sought to reduce disparities in access to health care by expanding health insurance coverage to populations with historically limited access to health care. In September 2010, an early provision of the ACA enabled young adults to remain on their parents' private insurance plans as dependents until the age of 26.³ Prior to the ACA, young adults (aged 19-25 years) had the highest rate of uninsurance compared to other age groups.^{2,4} High rates of uninsurance among the young adult population can significantly limit their access to health care. Therefore, young adults stood to benefit significantly from the insurance expansions mandated by the DCP.

Access to affordable health insurance has been especially problematic for young adults living in rural areas of the U.S. Rural populations face significant challenges in the availability and accessibility of health services due to inadequate infrastructure and chronic shortages of providers.⁵⁻⁷ In fact, over 75 percent of Health Professional Shortage Areas are located in rural areas of the U.S.⁶ This scarcity of rural health providers often results in longer travel distances for patients, which could reduce the likelihood of receiving needed care. Rural residents also have higher rates of unemployment, poverty, and uninsurance and compared to their urban counterparts, and therefore face greater financial burdens from out-of-pocket healthcare.⁵⁻⁸ Thus, opportunities to obtain insurance coverage through the DCP may have been especially advantageous for young adults living in rural and remote areas across the U.S. However, the benefits of expanded coverage could also bypass rural residents due to chronic shortages in the rural behavioral health care workforce, poor infrastructure, and geographic isolation.

It has been well documented that the DCP successfully reduced the uninsured rate among the young adult population.⁹⁻¹³ Furthermore, several studies have examined the effect of the DCP on access and utilization of various health services, including ED visits^{14,15}, hospital stays¹⁶, preventative services¹⁷⁻¹⁹, and dental care²⁰. While several studies have evaluated the effect of the DCP on the young adult population, empirical evidence of the impact of the DCP on access and utilization of health services in young adults has not been systematically reviewed. Further, the extent to which increases in insurance coverage resulting from the DCP have impacted young adult`s access to and

utilization of behavioral health services in rural areas compared to urban counterparts is unclear. Therefore, this dissertation examines the following three research questions in three separate studies:

1. How has the DCP impacted access to and utilization of health services among young adults since its implementation in 2010?
2. To what extent did the DCP impact access to and utilization of mental health treatment services among young adults residing in rural versus urban areas?
3. To what extent did the DCP impact access to and utilization of substance use disorder treatment services among young adults residing in rural versus urban areas?

Study one includes a comprehensive literature review of peer-reviewed studies that have examined the effect of the DCP on access and utilization of health care services among young adults and extended previous reviews by including literature published since 2016. Unlike prior reviews, the current systematic review was performed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines.²¹ Results from the systematic review provide an unbiased summary of current literature on the impact of the DCP in relation to access and utilization of health services among young adults. Results also highlight implications of the DCP for public policy and practice, and serve as a resource to identify opportunities for future research.

Evidence suggests that the DCP expanded insurance coverage to millions of individuals aged 19-25, resulting in significant changes in healthcare utilization among young adults.²⁻⁴ Despite this, the 2010 provision may not have impacted young adults

living in rural areas to the same extent as those in urban areas, because access to behavioral health services in rural areas is often limited due to geographic isolation, transportation barriers, and provider shortages.^{5-8,22} While a small number of studies have examined the DCP's impact on behavioral health services^{12, 23-25}, very few researchers have explored whether the 2010 provision had an equal impact on utilization of behavioral health services among rural versus urban residing young adults or reduced access barriers to the reception of behavioral health care in rural areas. Therefore, the studies two and three are intended to fill a critical void in our understanding of the implications of the dependent coverage provision on access to and utilization of behavioral health treatment services among rural and urban residing young adults. Using data from the National Survey on Drug Use & Health²⁶, study two used a quasi-experimental difference-in-differences approach²⁷⁻²⁹ to compare pre-post implementation changes in access to and utilization of mental health treatment among in young adults (ages 19-25 years versus 26-34 years) who met criteria for serious psychological distress in the past year, highlighting differences based on urban-rural residence.

Using the same dataset and quasi-experimental design, study three compared pre-post implementation changes in access and utilization of substance use disorder treatment among young adults (ages 19-25 years versus 26-34 years) meeting criteria for substance use disorder in the past year, examining differences by urban-rural residence. Results from studies two and three will help public health practitioners and policy makers better understand the cumulative impact of the DCP on access and utilization of

behavioral health treatment in young adults, and whether the impact differed by urban-rural residence.

Establishing the effectiveness of health policies is a key area of responsibility for health promotion specialists. Before we can make informed decisions about the future of health policy and reform, it is important we first evaluate and document the impact and outcomes of prior policy efforts to reduce health disparities and improve health.

Therefore, the results of the proposed study will improve our understanding of DCP's impact on young adult's access to and utilization of health care and whether the provision reduced urban-rural disparities in access to and utilization of behavioral health treatment among young people. These insights will help guide decision making on the future of health reform in America.

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CHAPTER II

IMPACTS OF THE AFFORDABLE CARE ACT'S DEPENDENT COVERAGE PROVISION ON ACCESS TO AND UTILIZATION OF HEALTH SERVICES – A SYSTEMATIC LITERATURE REVIEW

Background

The dependent coverage provision (DCP) under the Affordable Care Act (ACA) required health insurance policies that cover dependents to offer coverage for policyholder's children up to age 26.¹ Prior to implementation of the DCP the cutoff age for dependent insurance coverage was 19. It has been well documented that the provision successfully reduced the uninsured rate among the young adult population²⁻⁴. Furthermore, several studies have examined the effect of the DCP on access and utilization of health services, including emergency department (ED) visits^{5,6}, preventative services^{7,8}, and dental care.⁹

While a large number of studies have evaluated the effect of the DCP on the young adult population, to the authors knowledge, only one prior review¹⁰ has exclusively focused on the impact of key provisions of the ACA's DCP. While the existing review provides a summary of empirical research on the effects of the DCP on a variety of health related measures, the existing review is not systematic, as it does not adhere to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.¹¹ Furthermore, the authors of the previous review limited their search to studies published between 2010 and 2016, potentially excluding the most recent evaluations of the DCP. Thus, this chapter/study will extend on the previous

review by including the most recent literature on the impacts of the DCP on access to and utilization of health services among young adults and utilize PRISMA guidelines to conduct a thorough, systematic review of the literature. Specifically, the current literature review will address the following research question, “How has the DCP impacted access and utilization of health services among young adults since its implementation in 2010?” We anticipate that results from the proposed systematic review will provide an unbiased summary of current literature on the impact of the DCP in relation to access and utilization of health services among young adults, highlight implications for public policy and practice, and serve as a resource to identify opportunities for future research.

Methods

This review began with a search of the scientific literature using the Texas A&M University Library. We used the following search terms to identify relevant studies: “dependent coverage provision” OR “dependent coverage mandate” OR “dependent coverage expansion” AND “health care” OR “health services” OR “medical care” OR “access to care” OR “barriers to care.” Search terms were entered into the following databases to identify relevant studies: EBSCOHOST (Academic Search Ultimate, Business Source Ultimate, EconLit, APA Psych Info), PubMed, Web of Science, and Google Scholar. Once relevant articles were identified, keywords were examined to determine if there was a need to use additional search terms, however no additional search terms were identified.

Eligibility Criteria

Our search was limited to include only peer-reviewed articles that examine the effect of the DCP in relation to access and utilization of health services in young adults. Therefore, we will exclude studies that examine the DCP's impact on other outcomes such as health status, health behaviors, mortality, or labor market outcomes. Furthermore, studies on impacts of coverage expansions not specific to the DCP (i.e. Medicaid expansion, Health insurance exchanges, employer & individual mandates, impacts on older populations) will be excluded from the review. The DCP was implemented in 2010, therefore, studies published prior to 2010 will be excluded from our analysis. We will consider both quantitative and qualitative studies, but studies that simply describe the legislation or examine baseline data from before DCP implementation will be excluded from our review. Finally, only studies that have been published in English will be considered, meaning we will exclude studies published in other languages.

Study Selection and Data Extraction

Following our literature search in the above mentioned databases, the initial hits were exported into RAYYAN - a Qatar Computing Research Institute software product that offers a one stop dashboard to assist researchers with systematic review methodology.¹² After removing duplicates, all titles and abstracts were screened for potential inclusion based on the inclusion and exclusion criteria. Following the initial screening, the researcher read the full text of selected studies in order to further assess their eligibility for inclusion. We also utilized the pearling method¹³ to examine the

references lists of selected articles to identify additional articles that may have been missed by the initial database searches. If new studies are identified (from reference list of identified articles), those articles were also screened, reviewed, and selected for inclusion or exclusion based on eligibility criteria

A standardized data form was used to collect the following data items from the included studies: full reference of study, the data source, age groups and sample sizes for intervention and comparison populations (if used), the time periods representing the pre- and post-implementation periods, covariates, analytic approach, outcome measures, and key findings.

Results

We searched several databases for peer-reviewed articles related to the DCP's effect on access to and utilization of health services, which returned 323 peer-reviewed articles. After removing duplicates, 95 unique articles were retained. Review of titles and abstracts reduced eligible papers to a set of 69 full-text articles assessed for eligibility. After further excluding 9 of the 69 full text articles, we were left with a final set of 60 articles to be included in the systematic review. It is important to note that several articles reported impacts on multiple healthcare access and utilization outcomes (see appendix A figure A.1 for a PRISMA flow Diagram). Thus, of the 60 included articles, 18 examined outcomes related to access to healthcare, 11 examined outcomes related to utilization of healthcare, and 31 examined outcomes for both access to and utilization of healthcare. Outcomes related to 1.) access to health care and 2.) utilization of health care are presented separately under the subheadings below.

Access to Health Care

A total of 50 articles examined the impacts of the DCP on various measures of access to care. We separate these into studies of insurance status, usual source of care, delayed/forgone care, and healthcare expenditures. Results for each of the outcome domains are described in the following sections. Please note that articles containing analyses from more than one dataset are listed separately in the tables below.

Insurance Coverage

Forty-seven articles examined the DCP's impact on insurance coverage (Table 2-1). Of these, thirty-two used national surveys, fifteen use registry or administrative data, one used Centers of Disease Control and Prevention (CDC) birth certificate data, and one used data from the Pregnancy Risk Assessment Monitoring System. It is important to note that two articles utilized more than one data source in their analysis.^{14,15} Forty-six articles utilized a quasi-experimental difference-in-differences (DD) approach. The DD approach is often used to estimate the effect of a particular intervention (such as a passage of law or enactment of policy) by comparing changes in outcomes over time between a group expected to be affected by the policy change relative to a group that was not affected by the policy change. Forty articles used individuals ranging from age 18-25 as the target population impacted by the provision, while the remaining six articles used variations of age groups ranging between 20-26 years as the target population. All but two articles utilized age groups ranging from 26-35 as the comparison group that was not impacted by the provision. Of these, one article¹⁶ compared individuals using a younger comparison group, aged 13-18, while another study¹⁷ included a both a younger

comparison group, aged 16-18, in addition to an older comparison group aged 27-29. Twenty-one articles excluded 26 year olds from their analysis, likely as a precaution to minimize measurement error since 26 is a transition age between eligibility and ineligibility under the provision. Six studies utilized narrow age ranges that were slightly below the DCP's age cutoff of 26 for the treatment group, and a comparison group age ranges that were slightly above the provision's cutoff in order to control for pre-existing age-related trends that could confound results from the model. One article did not utilize a comparison group, but instead used a DD approach to compare changes in rates of health insurance among urban and rural young adults aged 19-25 years. Another article did not utilize DD study design, and therefore did not contain a comparison group.¹⁸

Despite slight differences in the age ranges and pre-post periods used across studies, findings across studies consistently indicate that the DCP had a positive effect on health insurance coverage. Thirty-eight articles examined the impact of the DCP on having any type of insurance. Of these, thirty-six articles reported that the DCP significantly increased the likelihood of being covered by any insurance type. While the remaining two studies also found evidence that the DCP increased insurance coverage of any type, these findings did not reach statistical significance. Twenty-seven articles examined the DCP's impact on private insurance coverage, including four articles that examined the provisions impact on private dental insurance. Of these, twenty-six articles reported that the DCP significantly increased the proportion of young adults with private insurance coverage, and one reported no effect. The one article that found no effect examined outcomes among a special subset of individuals with cystic fibrosis.¹⁹

Usual Source of Care

Five articles use national survey data examined the impact of the DCP on reported access to a usual source of care, or a provider or facility where one regularly receives care (Table 2-2). Of these, four studied utilized a DD approach, while the remaining used a logistic regression. Three studies utilized data from the Behavioral Risk Factor Surveillance System (BRFSS), and all reported that the DCP significantly increased the probability of having a usual source of care, despite using different age ranges and pre-post time periods.²⁰⁻²² Conversely, the remaining two articles report the DCP had no effect on having a usual source of care, in spite of using different datasets and methodological approaches.²³⁻²⁴

Delayed or Forgone Care

Ten articles examined the impact of the DCP on forgone or delayed care (Table 2-3). Of these, nine utilized national survey data, and the remaining article examined outcomes from a clinical oncology database. Evidence from these studies are mixed. Five studies, using data from the NHIS (National Health Interview Survey) or BRFSS, reported that the DCP significantly decreased reports of delayed or forgone care, including medical care, dental care, and prescription drug services. Alternatively, the remaining five studies reported that the DCP had no effect on reported delayed or forgone care, including medical care, mental health care, cancer treatment, and prescription service use. Interestingly, two of these articles used the same datasets as the aforementioned studies reporting significant reductions in in the same outcome (medical care).

Healthcare Expenditures

Six articles investigated the impact of the DCP on out of pocket (OOP) expenditures on health care (Table 2-4), all using the Medical Expenditures Panel Survey (MEPS). Of these, five articles reported reductions as a result of the DCP. In particular, one study found that the DCP resulted in significant decreases in average OOP medical expenditures and share of total OOP medical expenditures by 18.0 and 3.7 percentage points, respectively. Another study found that the DCP significantly reduced high out-of-pocket expenditures, defined as total yearly expenses greater than \$1,500 (Busch, Golberstein, & Meara, 2014).²⁵ A third article also found significant declines in the proportion of health expenditures paid OOP using a subsample of individuals with behavioral health conditions.²⁶ Two additional articles reported significant decreases in OOP expenditures for prescription medication following the DCP.^{27,28} Only one article found that the DCP had no effect on the proportion of medical expenditures paid OOP, despite using the same dataset and outcomes as the other studies.²⁹

Utilization of Health Care

A total of forty-two articles examined the impact of the DCP on various aspects of health care utilization. We separate these into studies of emergency department visits, hospital stays, preventative or routine care, behavioral health treatment, dental care, and sexual and reproductive health services.

Emergency Department Visits

Nine articles investigated the DCP's impact on ED utilization, five using national or state-level administrative records, and four using national surveys (Table 2-5). Four

out of the five studies that used administrative data reported significant reductions in ED utilization as a result of the DCP. In particular, one study using the national ED database found that the provision was associated with a significant decrease of 1.6 per 1000 in the quarterly rate of ED visits, equivalent to 191,072 visits a year.³⁰ Another study used administrative data from three states, and also found a significant decrease of 0.5% in the number of ED visits per 1,000 people, an implied reduction of approximately 14,000 visits within these states.³¹ Two additional studies examined psychiatric ED visits in California, and both found a significant reduction in the rate of emergency department visits for psychiatric care.^{32,33} Among the articles using administrative datasets, one examined ED encounters for opioid overdose and found no effect.³⁴ Of the four remaining studies that leveraged data from three national surveys, all found that the DCP had no effect utilization of ED services.

Hospital Stays

Nine articles examined the impact on the DCP on hospital stays, six using administrative datasets, and three using data from the MEPS (Table 2-6). Using administrative data, one study found that the DCP resulted in a significant 3.5% increase in non-birth hospitalizations, as well as a significant 9% increase in mental-health-related hospitalizations.³⁰ Another study used both national and state-level administrative databases to examine the DCP's effect on psychiatric hospital admissions. This study found that the DCP resulted in a significant increase in the likelihood of psychiatric admission in the national dataset, but had no effect on psychiatric admissions in the state-level dataset (California).³² Two studies used administrative data to examine

the provisions impact on hospital admissions for perforated appendix, and both reported significant declines in hospitalizations for perforated appendix, one finding a decrease of 1.4%³⁵, and the other finding a decrease of 1.6%.³⁶ Another study used inpatient data from Maryland to examine utilization of inpatient rehabilitation services among trauma patients, and found a significant 1.1% increase in use of hospital rehabilitation services as a result of the DCP.³⁷ An additional study examined use of hospital intensive care services among trauma patients using state-level inpatient data, and found that the DCP had no effect on ICU length of stay.³⁸ The remaining three studies utilized data from the MEPS, and all three found that the DCP had no effect on inpatient hospital stays.

Routine, Primary, or Preventative Care

Twelve articles examined the impact of the DCP on utilization of routine, primary, or preventative care, eleven using national surveys and one using registry/administrative data (Table 2-7). A majority of studies utilized a DD design, with the exception of two studies that utilized a logistic regression approach. Four articles whether the DCP increased the likelihood of having more than one outpatient physician visit. Eight articles assessed whether the DCP increased the likelihood of having more than one physician visit, and all but one found no effect. The exception assessed the provisions impact on the number of reported doctors' visits in the past year found that the DCP resulted in a significant 2.9 percentage point increase the number of past year doctors' visits.³⁹

Five articles examined the DCP's impact on reception of a routine check-up or physical exam in the past year, with four reporting no effect. The remaining article found

that the percentage of young adults receiving routine checkups increased significantly following the DCP, from 42.4% in 2006 to 49.5% in 2012.²³ Another article examined the impact of the DCP on reception of routine care for cystic fibrosis (defined as ≥ 4 clinic visits, ≥ 4 respiratory cultures, and ≥ 2 pulmonary function tests) and found the DCP had no effect on use of routine care for cystic fibrosis.¹⁹

One study³⁹ found that the DCP resulted in a significant increase in blood pressure monitoring while another study¹⁸ that found the provision no effect on blood pressure monitoring but did significantly increase rates of cholesterol screening. Four studies found that the DCP had no effect on reception of the flu vaccine, and three articles found the provision had no effect on prescription drug fills.

Behavioral Health Treatment

Six articles assessed the DCP's impact on use of behavioral health treatment services (Table 2-8), all using a DD approach. Of these, five articles used data from the National Survey on Drug Use and Health (NSDUH) to examine the impact of the DCP on utilization of mental health treatment services. Three articles reported that the DCP significantly increased utilization of mental health treatment of any kind. A similar article examined the impact of the DCP on specific types of mental health treatment, and found that while the DCP resulted in a significant two percentage point increase in monthly outpatient mental health treatment utilization, it had no effect on inpatient mental health treatment or use of mental health prescriptions.⁴⁰

Five articles examined the impact of the DCP in on use of substance use disorder (SUD) treatment services. Of these, three articles using the NSDUH reported that the

DCP had no effect on use of SUD treatment services. One article that also used the NSDUH found a significant increase in outpatient SUD services, but only among those who received any type of past year treatment.⁴¹ Therefore, results from this study reflect a shift in treatment settings but not an overall increase in SUD treatment utilization.⁴¹ The remaining article used The Treatment Episode Data Set (TEDS) and found a significant 11 percentage point decline in SUD treatment utilization following the DCP.⁴

Sexual and Reproductive Services

Eight articles examined the impact of the DCP on utilization of sexual or reproductive health services (Table 2-9). Of these, four articles utilize national survey data, two utilize the national cancer database, one used the Pregnancy Risk Assessment Monitoring System, and one utilized CDC public use nativity files. In terms of methodology, seven articles utilized a DD approach, and one utilized an interrupted time series design that did not include a comparison group. Four articles utilize national survey data to examine the impact of the DCP on a variety of preventative sexual and reproductive health services. Of these, one study⁴² found the DCP had no significant effect on use of birth control method or prescription, birth control counseling, medical testing related to birth control, or service utilization for STDs. Similarly, the second article found that the DCP had no significant effect on reception of a pap smear examination.⁴³ The remaining two articles examined the DCP's impact on HPV vaccination, and both found that the provision significantly increased HPV vaccine initiation and/or completion among young adult women, including those identifying as lesbian or bisexual.^{44,45}

Two articles utilize data from the national cancer database examine the impact of the DCP on fertility sparing treatment for gynecological cancers.^{46,47} Of these, one reported the DCP had no effect on fertility sparing treatment for cervical, endometrial, and ovarian cancers, while the other reported the DCP resulted in a significant 13.4 percentage point increase in fertility sparing treatment for cervical cancer.^{46,47}

Lastly, two articles examined the impact of the DCP on utilization of prenatal care. One article reported a significant 1.0 percentage point increase in early prenatal care, and a significant 0.4 percentage point increase in adequate prenatal care following the DCP.⁴⁸ Similarly, the second article reported a significant 3.6-percentage point increase in receipt of timely prenatal care, but no significant effect on receipt of a postpartum check-up or postpartum contraceptive use.⁴⁹

Dental Care

Four articles examined the impact of the DCP on utilization of dental care using national survey data from the NHIS and MEPS (Table 2-10). All but one of the articles¹⁸ utilized a DD approach. The exception used multivariable logistic regression models to examine the extent to which insurance accounted for differences service use. The articles utilize different time periods to characterize pre-post changes in dental care utilization, but all report significant increases in utilization of dental care following the DCP. One article found that the DCP resulted in a significant increase in receipt of dental check-ups by 5.9 percentage points³⁹, while the other found that the DCP significantly increased utilization of dental care by 3.3 percentage points.⁹ Another study found that the DCP was associated with a significant 4.8 percentage point increase in use of dental

treatments, yet had no effect on utilization of preventative dental services.⁵⁰ Consistent with findings from the other studies, the remaining article found that rates of annual dental visits among young adults increased significantly from 55.2% before the DCP to 60.9% after the DCP.¹⁸

Discussion

Based on the results of the review and our research question, “How has the DCP impacted access and utilization of health services among young adults since its implementation in 2010?”, we found evidence that the DCP was associated with improvements in access to and utilization of health care among young adults. More importantly, we found little evidence that the DCP resulted in negative consequences for young adults, as the two studies reporting adverse outcomes were limited to populations with special healthcare needs, such as cystic fibrosis or substance use disorder. Therefore, studies reporting positive effects of the DCP far outnumber those reporting negative outcomes, providing substantial evidence that the DCP achieved its anticipated goal of improving access to and utilization of health care.

Consistent with findings from prior reviews, we found strong evidence that the DCP achieved its desired effect on insurance coverage.^{10,51} Despite using multiple data sources and different variations of pre-post time periods and treatment and comparison age groups, nearly all studies found that the DCP resulted in a significant increase in any insurance coverage, indicating that the provision reduced the proportion of uninsured young people in the United States. Private insurance coverage also increased significantly as a result of the DCP, including private dental insurance coverage.

Findings of increased private dental insurance are surprising because the DCP did not directly apply to private dental benefits. Despite this, researchers suggest that dental insurance coverage for young adults expanded any way as a result of ACA “spillover” effects from the employer-sponsored mandate.⁹ More importantly, there is significant evidence that increases in coverage were primarily driven by substantial gains in private insurance coverage, as we found no indication that the DCP increased public insurance coverage among young adults.

We also found evidence that the DCP achieved its desired effect on other measures of access to care. For example, three articles found that the DCP significantly increased the probability of having a usual source of care. Increased access to a usual source of care has been shown to produce better health outcomes⁵², reduce health disparities⁵³, and lower healthcare costs.⁵⁴ Of the six articles examining the provision’s impact on healthcare expenditures, five reported significant reductions as a result of the DCP and only one found no effect. However, the exception excluded high cost outliers in the analysis, which could explain why findings were inconsistent with other reports. Reductions in the financial burden of health care could be especially beneficial for young adults given the low incomes and high debt burden in this age group.²⁶ Evidence on the provisions impact on delayed or forgone care remains unclear, indicating an opportunity for further investigation.

In regards to healthcare utilization, the DCP’s impact on ED visits and hospital stays appeared to vary depending on the data source used. Studies that used administrative datasets generally found that the DCP significantly reduced the number of

ED visits, including ED visits for psychiatric or mental health-related care. For hospital stays, there is some evidence that the provision increased hospitalizations for psychiatric or mental illness, as well as inpatient rehabilitation services (among trauma patients). Alternatively, hospitalizations for perforated appendix decreased as a result of the DCP, indicating that the provision reduced delays in seeking and accessing care for acute conditions. Interestingly, the studies that utilized data from national surveys all reported that the DCP had no effect on ED utilization and/or hospital stays. We suspect that the difference in findings across studies could be due to the self-report nature of survey data, which could be less accurate than administrative records of ED encounters. Furthermore, administrative datasets have greater statistical power to detect provision effects than the national surveys used to examine ED visits and hospital stays.¹⁰

Evaluating the impact of the DCP on utilization of behavioral health care is particularly important given the high prevalence of untreated behavioral health conditions affecting the young adult population.⁵⁵ There is evidence that the DCP increased utilization of mental health treatment services in the general population, which is consistent with findings of increased utilization of ED and hospital psychiatric or mental illness mentioned above. However, evidence regarding the DCP's impact on SUD treatment is less promising. We found no evidence that the DCP increased utilization of outpatient SUD treatment services, which is particularly concerning given the ongoing opioid epidemic plaguing our nation. Thus, findings indicate a need for continued action to improve disparities in access to and utilization of treatment for substance use disorders.

Primary care visits can present a key opportunity for improving the health of young adults through preventive screenings, early detection and treatment of disease.^{56,57} Evidence suggests that utilization of primary health care in young adulthood can prevent long-term health issues from developing in the future. One anticipated impact of expanded insurance coverage among young adults was increased access to and use of routine primary care services. However, we found little evidence that the DCP increased primary care service utilization. Most articles found that the DCP had no effect on young adult`s use of primary care visits, with the exception of two of studies that found the DCP had a positive impact on use of specific routine services, including blood pressure monitoring and cholesterol screenings. The limited impact of the DCP on primary care utilization could indicate that there are additional barriers to reception of primary care among young adults, such as health literacy challenges, difficulties navigating a complicated health system, or obstacles transitioning from pediatric to adult primary care providers.

Reproductive and sexual health care is an integral component of women`s overall health and well-being, especially in young adulthood when risky sexual behaviors are most likely to occur.^{58,59} While the DCP offered young adult women the opportunity to obtain essential sexual and reproductive health care, evidence is mixed regarding the provisions impact on utilization of reproductive or sexual health services. Several studies found that the provision had no effect certain preventative sexual or reproductive health services such as contraceptive use, STD screenings, or pap smear examinations. There is some evidence that the DCP had a positive impact on prenatal care utilization, reception

of fertility sparing treatment for gynecological cancers, and initiation and completion of HPV vaccines. However, it is important to note one study that examined the DCP's impact on HPV vaccination initiation using a sample of women aged 15-25 years.⁴⁴ Because the DCP only targeted young adults between the ages of 19-25, the inclusion of 15-18 year olds in the study population may have resulted in an over or underestimation of the DCP's true effects.

A growing body of evidence has demonstrated a connection between oral health and systemic illnesses including cardiovascular disease, diabetes, chronic obstructive pulmonary disease, asthma, and depression.⁶⁰ Thus, access to adequate dental care is essential to promoting and maintaining good oral and overall health. While only four articles examined the impact of the DCP on dental care utilization, the findings remarkably consistent with all studies reporting a significant increase in dental care utilization as a result of the DCP. These findings are consistent with the findings of increased private dental insurance coverage noted previously.

Methodological Issues

Nearly all of the reviewed studies utilized a DD approach to estimate the impact of the DCP by comparing outcomes for a policy-affected age group relative to a slightly older comparison group. The benefit of using a DD approach is its potential control for bias from unobserved variables that remain fixed over time.^{61,62} However, the validity of the DD approach relies on the parallel trends assumption. The premise of the parallel trends assumption is that trends in the outcome of interest before the policy are similar in both the policy-affected group and policy unaffected comparison group, therefore, in the

absence of policy change (i.e. DCP), outcomes in the comparison group would follow the same trends as those in the policy-affected intervention group.⁶¹⁻⁶³ This means that a violation of the parallel trends assumption would result in a biased estimation of the DCP's impact. Therefore, the validity of the parallel trends assumption is an important aspect to consider, especially given the number of studies utilizing a DD approach. While there is no formal statistical test to prove that the intervention and comparison groups follow the same trends in absence of policy change, falsification tests are often used as alternative way to evaluate the validity of the parallel trends assumption.^{65,65} Thirty-two studies used falsification tests to evaluate the robustness of their results by re-running DD models using only pre-intervention data, alternative comparison groups, a “fake” intervention group (i.e. a group that was not affected by the policy), or a “fake” outcome (i.e. an outcome that was not affected by the policy). The idea here is that the policy should have no impact on pre-implementation trends, or policy unaffected intervention groups or outcomes. If a significant impact is found using these alternative specifications, then there may be unobserved or unaccounted for factors outside of the policy that caused the change in outcome, indicating a violation of the parallel trends assumption.^{60,61} However, of the twenty-five studies that employed falsification tests, most generally found that their reported impacts did not appear to be the byproduct of factors unrelated to the DCP or an artifact of pre-existing trends.

Limitations

In practice, two reviewers are involved in the literature review process in order to minimize this risk of selection bias. However, due to restricted time and resources, the

current systematic review included only one reviewer – increasing the risk of selection bias. Several strategies were employed to reduce the risk of additional bias, including: a focused research question, a comprehensive search of several databases, and the use of explicit inclusion and exclusion criteria.

Conclusion

Evaluating the effectiveness of health policies is a key area of responsibility for health promotion specialists. The current review provides a comprehensive summary of the current literature on the impact of the DCP in relation to access and utilization of health services among young adults. Studies so far suggest that the DCP increased young adult's private insurance coverage, access to a usual source of care, and reduced medical expenditures and out of pocket health care costs. The positive effect of the DCP on access to care measures translated into increased utilization of some health services, including behavioral health services and dental care, while evidence of the DCP's impact on ED visits, hospital stays, and use of sexual/reproductive health services remains unclear- highlighting a need for additional research on these topics. However, despite improvements in insurance coverage following the DCP, utilization of preventive/primary care services among young adults remains suboptimal, potentially indicating that additional barriers to utilization of these services remain. While a primary objective of the DCP was to reduce health disparities in healthcare access and utilization, studies examining the impact of the DCP on healthcare related disparities are extremely limited in the literature. Thus, future studies should explore how the DCP has impacted disparities in access to and utilization of health care among vulnerable populations.

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Table 2-1. Studies on the Effects of the Dependent Coverage Provision on Insurance Status

Study	Data Source	Intervention		Control		Time Period		Key Findings
		age group	sample size	age group	sample size	Pre DCP	Post DCP	
Akosa Antwi, Y., Moriya, A. S., & Simon, K. (2013). Effects of federal policy to insure young adults: evidence from the 2010 Affordable Care Act's dependent-coverage mandate. <i>American Economic Journal: Economic Policy</i> , 5(4), 1-28.	SIPP	19-25	16,803	16-18 and 27-29	18,059	8/2008-2/2010	9/2010-11/2011	+ Increase in any insurance + Increase in private insurance ≠ No effect on public insurance
Antwi, Y. A., Moriya, A. S., Simon, K., & Sommers, B. D. (2015). Changes in emergency department use among young adults after the Patient Protection and Affordable Care Act's dependent coverage provision. <i>Annals of emergency medicine</i> , 65(6), 664-672.	NIS	19-25	736969	27-29	377345	1/2007-3/2010	9/2010-12/2011	+ Increase in any insurance + Increase in private insurance - Decrease in public insurance
Amuedo-Dorantes, C., & Yaya, M. E. (2016). The impact of the ACA's extension of coverage to dependents on young adults' access to care and prescription drugs. <i>Southern Economic Journal</i> , 83(1), 25-44.	NHIS	19-25	69757	26-29	41714	2002-9/2010	10/2011-2013	+ Increase in any insurance
Barbaresco, Silvia, Charles J. Courtemanche, and Yanling Qi. "Impacts of the Affordable Care Act dependent coverage provision on health-related outcomes of young adults." <i>Journal of health economics</i> 40 (2015): 54-68.	BRFSS	23-25	49,502	27-29	68,892	1/2007-9/2010	10/2010-12/2013	+ Increase in any insurance
Barnes, J. M., Harris, J. K., Brown, D. S., King, A., & Johnson, K. J. (2019). Impacts of the affordable care act dependent coverage provision on young adults with cancer. <i>American journal of preventive medicine</i> , 56(5), 716-726.	SEER	19-25	21405	27-29	15496	2007-2009	2011-2014	+ Increase in any insurance
	NCDB	19-25	53351	27-29	39007	2007-2009	2011-2014	+ Increase in any insurance
Busch, S. H., Golberstein, E., & Meara, E. (2014). ACA dependent coverage provision reduced high out-of-pocket health care spending for young adults. <i>Health affairs</i> , 33(8), 1361-1366.	MEPS	19-25	15427	26-29	8617	2007-2009	2011	+ Increase in any insurance
Busch, S. H., Golberstein, E., Goldman, H. H., Loveridge, C., Drake, R. E., & Meara, E. (2019). Effects of ACA Expansion of Dependent Coverage on Hospital-Based Care of Young Adults With Early Psychosis. <i>Psychiatric Services</i> , 70(11), 1027-1033.	NIS & NEDS (combined)	20-25	Not reported	27-29	Not reported	1/1/2006 - 3/31/2010	10/1/2010 - 12/31/2013	+ Increase in private insurance ≠ No effect on public insurance
	CA inpatient & ED database (combined)	20-25	Not reported	27-29	Not reported	1/1/2005 - 3/31/2010	10/1/2010 - 12/31/2013	+ Increase in private insurance ≠ No effect on public insurance
Cantor, J. C., Monheit, A. C., DeLia, D., & Lloyd, K. (2012). Early impact of the Affordable Care Act on health insurance coverage of young adults. <i>Health services research</i> , 47(5), 1773-1790.	CPS	19-25	85,158	27-30	71,203	2004-2009	2010	+ Increase in any insurance + Increase in private insurance ≠ No effect on public insurance
Chan, S. S., Gindling, T. H., & Miller, N. A. (2018). The Effect of the Affordable Care Act's Dependent Coverage Provision on Health Insurance Gaps for Young Adults With Special Healthcare Needs. <i>Journal of Adolescent Health</i> , 63(4), 445-450.	SIPP	19-25	2520	27-29	796	2008-2010	2011-2013	Reduced coverage gaps (i.e. increased coverage rates)

Table 2-1 Continued

Study	Data Source	Intervention		Control		Time Period		Key Findings
		age group	sample size	age group	sample size	Pre DCP	Post DCP	
Chavez, L. J., Kelleher, K. J., Matson, S. C., Wickizer, T. M., & Chisolm, D. J. (2018). Mental health and substance use care among young adults before and after Affordable Care Act (ACA) implementation: A rural and urban comparison. <i>The Journal of Rural Health, 34</i> (1), 42-47.	NSDUH	18-25	39,482	No control	NA	2008-2010	2011-2014	+ Increase in any insurance
Daw, J. R., & Sommers, B. D. (2018). Association of the Affordable Care Act dependent coverage provision with prenatal care use and birth outcomes. <i>Jama, 319</i> (6), 579-587.	CDC public-use nativity files	24-25	1379005 births	27-28	1551192 births	2009	2011-2013	+ Increase in private insurance - Decrease in public insurance (Medicaid) - Decrease in self-pay/uninsurance
Chua, K. P., & Sommers, B. D. (2014). Changes in health and medical spending among young adults under health reform. <i>Jama, 311</i> (23), 2437-2439.	MEPS	19-25	26,453	26-34	34,052	2002-2009	2011	+ Increase in any insurance
Eliason, E. (2019). The effects of the dependent coverage provision on young women's utilization of sexual and reproductive health services. <i>Preventive Medicine, 129</i> , 105863.	National Survey of Family Growth data	19-25	3615	27-34	4034	2006-2009	2011-2013	+ Increase in any insurance
Han, X., Yabroff, K. R., Robbins, A. S., Zheng, Z., & Jamal, A. (2014). Dependent coverage and use of preventive care under the Affordable Care Act. <i>The New England journal of medicine, 371</i> (24), 2341.	MEPS	19-25	10,150	26-30	7044	2009	2011-2012	+ Increase in private dental insurance
Huang, J., & Porterfield, S. L. (2019). Changes in health insurance coverage and health care access as teens with disabilities transition to adulthood. <i>Disability and health journal, 12</i> (4), 551-556.	NHIS	19-25	3832	13-18	6304	2006-2009	2011-2015	+ Increase in private insurance ≠ No sig effect on any insurance ≠ No effect on public insurance
Jhamb, J., Dave, D., & Colman, G. (2015). The Patient Protection and Affordable Care Act and the utilization of health care services among young adults. <i>International Journal of Health and Economic Development, 1</i> (1), 8.	NHIS	19-25	21,993	27-33	26,750	2005-2009	2011-2013	+ Increase in any insurance
Kotagal, M., Carle, A. C., Kessler, L. G., & Flum, D. R. (2014). Limited impact on health and access to care for 19-to 25-year-olds following the Patient Protection and Affordable Care Act. <i>JAMA pediatrics, 168</i> (11), 1023-1029.	BRFSS	19-25	Not reported	26-34	Not reported	2009	2012	+ Increase in any insurance
Kozloff, N., & Sommers, B. D. (2017). Insurance Coverage and Health Outcomes in Young Adults With Mental Illness Following the Affordable Care Act Dependent Coverage Expansion. <i>The Journal of clinical psychiatry, 78</i> (7), e821-e827.	NSDUH	19-25	19051	26-34	7958	2008-2009	2011-2013	+Increase in any insurance + Increase in private insurance ≠ No effect on public insurance

Table 2-1 Continued

Study	Data Source	Intervention		Control		Time Period		Key Findings
		age group	sample size	age group	sample size	Pre DCP	Post DCP	
Lau, J. S., Adams, S. H., Park, M. J., Boscardin, W. J., & Irwin, C. E. (2014). Improvement in preventive care of young adults after the Affordable Care Act: the Affordable Care Act is helping. <i>JAMA pediatrics</i> , 168(12), 1101-1106.	MEPS	18-25	7485	No control	NA	2009	2011	+ Increase in any insurance + Increase in private insurance
Li, R., Bauman, B., D'angelo, D. V., Harrison, L. L., Warner, L., Barfield, W. D., & Cox, S. (2019). Affordable Care Act-dependent insurance coverage and access to care among young adult women with a recent live birth. <i>Medical care</i> , 57(2), 109-114.	Pregnancy Risk Assessment Monitoring System	18-25	22,599	27-31	22,361	1/2009-2/2010	1/2011-12/2013	+ Increased private insurance coverage* - Decrease public insurance* ≠ No sig effect on any insurance* * = during pregnancy, at delivery
Lipton, B. J., & Decker, S. L. (2015). ACA provisions associated with increase in percentage of young adult women initiating and completing the HPV vaccine. <i>Health affairs</i> , 34(5), 757-764.	NHIS	19-25	7,975	18 or 26	2035	1/2008-9/2010	10/2010-12/2012	+ Increase in any insurance
Look, K. A., & Arora, P. (2016). Effects of the Affordable care act's young adult insurance expansion on prescription drug insurance coverage, utilization, and expenditures. <i>Research in Social and Administrative Pharmacy</i> , 12(5), 682-698.	MEPS	19-25	6451	27-30	3589	2009	2011	+ Increase in any insurance + Increase in private insurance ≠ No effect on public insurance
Look, K. A., Kim, N. H., & Arora, P. (2017). Effects of the Affordable Care Act's dependent coverage mandate on private health insurance coverage in urban and rural areas. <i>The Journal of Rural Health</i> , 33(1), 5-11.	MEPS	19-25	8690	27-34	10485	2006-2009	2011	+ Increase in private insurance
O'Hara, B., & Brault, M. W. (2013). The disparate impact of the ACA-dependent expansion across population subgroups. <i>Health services research</i> , 48(5), 1581-1592.	CPS	19-25	1474910 *based on approx percent of total	26-29	794182	2008-9/2010	10/2010-2011	+ Increase in any insurance + Increase in private insurance
Parsons, H. M., Schmidt, S., Tenner, L. L., Bang, H., & Keegan, T. H. (2016). Early impact of the Patient Protection and Affordable Care Act on insurance among young adults with cancer: analysis of the dependent insurance provision. <i>Cancer</i> , 122(11), 1766-1773.	SEER	18-25	21299	26-29	18333	1/2007-9/2010	10/2010-12/2012	+ Increase in any insurance ≠ No effect on public insurance
Saloner, B., Akosa Antwi, Y., Maclean, J. C., & Cook, B. (2018). Access to health insurance and utilization of substance use disorder treatment: Evidence from the Affordable Care Act dependent coverage provision. <i>Health economics</i> , 27(1), 50-75.	TEDS	21-24	Not reported	30-34	Not reported	2007-2009	2011-2013	+ Increase in any insurance + Increase in private insurance ≠ No effect on public insurance

Table 2-1 Continued

Study	Data Source	Intervention		Control		Time Period		Key Findings
		age group	sample size	age group	sample size	Pre DCP	Post DCP	
Scott, J. W., Sommers, B. D., Tsai, T. C., Scott, K. W., Schwartz, A. L., & Song, Z. (2015). Dependent coverage provision led to uneven insurance gains and unchanged mortality rates in young adult trauma patients. <i>Health Affairs</i> , 34(1), 125-133.	National Trauma Data Bank	19-25	246282 encounters	26-34	217886 encounters	2007-2009	2011-2012	+ Increase in any insurance + Increase in private insurance - Decrease in public insurance
Scott, J. W., Salim, A., Sommers, B. D., Tsai, T. C., Scott, K. W., & Song, Z. (2015). Racial and regional disparities in the effect of the Affordable Care Act's dependent coverage provision on young adult trauma patients. <i>Journal of the American College of Surgeons</i> , 221(2), 495-501.	National Trauma Data Bank	19-25	529844	27-34	484974	2007-2009	2011-2012	+ Increase in any insurance
Scott, J. W., Rose, J. A., Tsai, T. C., Zogg, C. K., Shrim, M. G., Sommers, B. D., ... & Haider, A. H. (2016). Impact of ACA insurance coverage expansion on perforated appendix rates among young adults. <i>Medical care</i> , 54(9), 818.	NIS	19-25	52116	26-34	58436	2006-2010	2011-2012	+ Increase in any insurance + Increase in private insurance
Shane, D. M., & Ayyagari, P. (2014). Will health care reform reduce disparities in insurance coverage? Evidence from the dependent coverage mandate. <i>Medical care</i> , 528-534.	MEPS	19-25	7962	27-34	9321	2008-2009	2011	+ Increase in private insurance
Shane, D. M., & Ayyagari, P. (2015). Spillover effects of the Affordable Care Act? Exploring the impact on young adult dental insurance coverage. <i>Health services research</i> , 50(4), 1109-1124	MEPS	19-25	12587	27-30	7361	2006-2009	2011	+ Increase in private dental insurance
Shane, D. M., Ayyagari, P., & Wehby, G. (2016). Continued gains in health insurance but few signs of increased utilization: an update on the ACA's dependent coverage mandate. <i>Medical Care Research and Review</i> , 73(4), 478-492.	MEPS	19-25	15,765	27-34	18,454	2006-2009	2012	+ Increase in private insurance
Slusky, D. J. (2017). Significant placebo results in difference-in-differences analysis: The case of the ACA's parental mandate. <i>Eastern Economic Journal</i> , 43(4), 580-603.	SIPP	25	Not reported (entire sample = 21,616)	27	Not reported (entire sample = 21,616)	2008-2009	2011	+ Increase in any insurance
Smith, A. J. B., & Fader, A. N. (2018). Effects of the Affordable Care Act on young women with gynecologic cancers. <i>Obstetrics & Gynecology</i> , 131(6), 966-976.	NCDB	21-26	3971	27-35	20238	2006-2009	2011-2014	+ Increase in any insurance
Sommers, B. D., Buchmueller, T., Decker, S. L., Carey, C., & Kronick, R. (2013). The Affordable Care Act has led to significant gains in health insurance and access to care for young adults. <i>Health affairs</i> , 32(1), 165-174	NHIS	19-25	79,361	26-34	37,175	2005-8/2010	9/2010-9/2011	+ Increase in any insurance + Increase in private insurance ≠ No effect on public insurance

Table 2-1 Continued

Study	Data Source	Intervention		Control		Time Period		Key Findings
		age group	sample size	age group	sample size	Pre DCP	Post DCP	age group
Tumin, D., Li, S. S., Kopp, B. T., Kirkby, S. E., Tobias, J. D., Morgan, W. J., & Hayes Jr, D. (2017). The effect of the affordable care act dependent coverage provision on patients with cystic fibrosis. <i>Pediatric pulmonology</i> , 52(4), 458-466.	Cystic Fibrosis (CF) Foundati on Patient Registry	18-25	4024	26-35	3132	2007–2009	2011–2013	≠ No sig effect on private insurance
VanGarde, A., Yoon, J., Luck, J., & Mendez-Luck, C. A. (2018). Racial/ethnic variation in the impact of the affordable care act on insurance coverage and access among young adults. <i>American journal of public health</i> , 108(4), 544-549.	BRFSS	19-25	121523	26-35	129426	2007–2009	2011-2013	+ Increase in any insurance
Vujcic, M., Yarbrough, C., & Nasseh, K. (2014). The effect of the Affordable Care Act’s expanded coverage policy on access to dental care. <i>Medical Care</i> , 52(8), 715-719.	NHIS	19-25	Not reported	26-34	Not reported	2008-2010	2011 and 2012	+ Increase in private dental insurance
Winkelman, T. N., Kieffer, E. C., Goold, S. D., Morenoff, J. D., Cross, K., & Ayanian, J. Z. (2016). Health insurance trends and access to behavioral healthcare among justice-involved individuals—United States, 2008–2014. <i>Journal of general internal medicine</i> , 31(12), 1523-1529.	NSDUH	19-25	10209	26-34	2798	2008-8/2010	2011-2014	+ Increase in any insurance + Increase in private insurance ≠ No effect on public insurance
Zogg, C. K., Chew, F. P., Scott, J. W., Wolf, L. L., Tsai, T. C., Najjar, P., ... & Canner, J. K. (2016). Implications of the Patient Protection and Affordable Care Act on insurance coverage and rehabilitation use among young adult trauma patients. <i>JAMA surgery</i> , 151(12), e163609-e163609.	Maryland Health Services Cost Review Commission data	18-25	19216	26-34	16932	1/2008-9/2010	1/2011-9/2013	+ increase in any insurance + increase in private insurance - Decrease in public insurance
Zogg, C. K., Scott, J. W., Davis, K. A., Dimick, J. B., & Haider, A. H. (2018). Impact of Affordable Care Act Insurance Expansion on Access to Care: Changes in Perforated Appendix Rates among Adults after Medicaid Expansion and the Dependent Coverage Provision. <i>Journal of the American College of Surgeons</i> , 227(4), S148.	State inpatient Databases,	19-25	119,684	26-34	122307	1/2008-9/2010	1/2011-9/2013	+ Increase in any insurance +increase in private insurance - Decrease in public insurance
Amuedo-Dorantes, C., & Yaya, M. E. (2013). The Impact of the ACA’s Extension of Coverage to Dependents on Young Adults’ Access to Care.	NHIS	19-25	24140	26-29	16814	2002-9/2010	10/2010-2011	+ Increase in any insurance
Bush, H., Gerber, L. H., Stepanova, M., Escheik, C., & Younossi, Z. M. (2018). Impact of healthcare reform on the payer mix among young adult emergency department utilizers across the United States (2005–2015). <i>Medicine</i> , 97(49).	NHAM CS	19-25	41,553 ED visits	26-30	not reported	2005-2010	2011-2013	+ Increase in private insurance - Decrease in public insurance

Table 2-1 Continued

Study	Data Source	Intervention		Control		Time Period		Key Findings
		age group	sample size	age group	sample size	Pre DCP	Post DCP	age group
Han, X., Zhao, J., Ruddy, K. J., Lin, C. C., Sineshaw, H. M., & Jemal, A. (2018). The impact of dependent coverage expansion under the Affordable Care Act on time to breast cancer treatment among young women. <i>PLoS one</i> , 13(6).	NCDB	19-25	431	26-34	6745	2007-2009	2011-2013	≠ No effect on any insurance
Porterfield, S. L., & Huang, J. (2016). Affordable Care Act provision had similar, positive impacts for young adults with and without disabilities. <i>Health Affairs</i> , 35(5), 873-879.	NHIS	19-25	3253	26-34	4960	2006-2009	2011-2014	+ Increase in any insurance + Increase in private insurance ≠ No effect on public insurance
Wallace, J., & Sommers, B. D. (2015). Effect of dependent coverage expansion of the Affordable Care Act on health and access to care for young adults. <i>JAMA pediatrics</i> , 169(5), 495-497.	BRFSS	19-25	142356	26-34	1214610	3/30/2010 - 9/22/2010	9/23/2010 - 2012	+ Increase in any insurance
Shane, D. M., & Wehby, G. (2017). The impact of the Affordable Care Act's dependent coverage mandate on use of dental treatments and preventive services. <i>Medical care</i> , 55(9), 841.	MEPS	25	2727	27	2720	2006-2009	2011-2013	+ Increase in private dental insurance

+ Indicates statistically significant increase
 - Indicates statistically significant decrease
 ≠ Not significant

Table 2-2 Studies of the Effects of the Dependent Coverage Provision on Usual Source of Care

Article	Data source	Treatment		Comparison		Time Period		Key Findings
		Age group	Sample Size	Age group	Sample Size	Pre DCP	Post DCP	
Barbaresco, Silvia, Charles J. Courtemanche, and Yanling Qi. "Impacts of the Affordable Care Act dependent coverage provision on health-related outcomes of young adults." <i>Journal of health economics</i> 40 (2015): 54-68	BRFSS	23-25	49502	27-29	68892	1/2007-9/2010	10/2010 - 12/2013	+ Increased likelihood of having a regular primary care doctor
Sommers, B. D., Buchmueller, T., Decker, S. L., Carey, C., & Kronick, R. (2013). The Affordable Care Act has led to significant gains in health insurance and access to care for young adults. <i>Health affairs</i> , 32(1), 165-174.	NHIS	19-25	79361	26-34	37175	2005-8/2010	9/2010-9/2011	≠ No effect on probability of having a usual source of care
Wallace, J., & Sommers, B. D. (2015). Effect of dependent coverage expansion of the Affordable Care Act on health and access to care for young adults. <i>JAMA pediatrics</i> , 169(5), 495-497.	BRFSS	19-25	142356	26-34	1214610	3/30/2010 - 9/22/2010	9/23/2010 - 12/31/2012	+ Increased likelihood of having a usual source of care
Kotagal, M., Carle, A. C., Kessler, L. G., & Flum, D. R. (2014). Limited impact on health and access to care for 19-to 25-year-olds following the Patient Protection and Affordable Care Act. <i>JAMA pediatrics</i> , 168(11), 1023-1029.	BRFSS†	19-25	Not reported	26-34	Not reported	2009	2012	+ Increased likelihood of usual source of care
Wong, C. A., Ford, C. A., French, B., & Rubin, D. M. (2015). Changes in young adult primary care under the affordable care act. <i>American journal of public health</i> , 105(S5), S680-S685.	MEPS	19-25	23,396 person-years	No control	N/A	2006-2009	2011-2012	≠ No effect on reported usual source of care

+ Indicates statistically significant increase
 - Indicates statistically significant decrease
 ≠ Not significant

Table 2-3 Studies on the Effects of the Dependent Coverage Provision on Delayed or Forgone Healthcare

Article	Data source	Treatment		Comparison		Time Period		Key Findings
		Age group	Sample Size	Age group	Sample Size	Pre DCP	Post DCP	
Amuedo-Dorantes, C., & Yaya, M. E. (2016). The impact of the ACA's extension of coverage to dependents on young adults' access to care and prescription drugs. <i>Southern Economic Journal</i> , 83(1), 25-44.	NHIS	19-25	69757	26-29	41714	2002-9/2010	10/2011-2013	- Reduced delayed medical care, - Reduced likelihood of delaying prescribed drugs
Barbaresco, Silvia, Charles J. Courtemanche, and Yanling Qi. "Impacts of the Affordable Care Act dependent coverage provision on health-related outcomes of young adults." <i>Journal of health economics</i> 40 (2015): 54-68.	BRFSS	23-25	49502	27-29	68892	1/2007-9/2010	10/2010-12/2013	≠ No effect on forgone medical care because of cost
Huang, J., & Porterfield, S. L. (2019). Changes in health insurance coverage and health care access as teens with disabilities transition to adulthood. <i>Disability and health journal</i> , 12(4), 551-556.	NHIS	19-25	3832	13-18	6304	2006-2009	2011-2015	≠ No effect on delayed or not receiving medical care due to cost
Kozloff, N., & Sommers, B. D. (2017). Insurance Coverage and Health Outcomes in Young Adults With Mental Illness Following the Affordable Care Act Dependent Coverage Expansion. <i>The Journal of clinical psychiatry</i> , 78(7), e821-e827.	NSDUH	19-25	19051	26-34	7958	2008-2009	2011-2013	≠ No effect on perceived unmet mental health care need due to cost
Pakyz, A., Wang, H., & Cunningham, P. (2017). Impact of Health Reform on Young Adult Prescription Medication Utilization. <i>American Journal of Managed Care</i> , 23(11), 670-676.	MEPS	19-25	19165	26-34	23892	2007-2009	2011-2013	≠ No effect on inability to obtain needed prescriptions due to cost
Sommers, B. D., Buchmueller, T., Decker, S. L., Carey, C., & Kronick, R. (2013). The Affordable Care Act has led to significant gains in health insurance and access to care for young adults. <i>Health affairs</i> , 32(1), 165-174	NHIS	19-25	79361	26-34	37175	2005-8/2010	9/2010-9/2011	- Reduced likelihood of delaying needed medical care due to cost. - Reduced likelihood of not receiving needed medical care due to cost
VanGarde, A., Yoon, J., Luck, J., & Mendez-Luck, C. A. (2018). Racial/ethnic variation in the impact of the affordable care act on insurance coverage and access among young adults. <i>American journal of public health</i> , 108(4), 544-549.	BRFSS	19-25	121523	26-35	129426	2007-2009	2011-2013	- Reduced likelihood of avoiding health care services due to cost
Vujicic, M., Yarbrough, C., & Nasseh, K. (2014). The effect of the Affordable Care Act's expanded coverage policy on access to dental care. <i>Medical Care</i> , 52(8), 715-719.	NHIS	19-25	38331** whole sample	26-34	38331* whole sample	2008-2010	2011 and 2012	- Reduced financial burdens to reception of dental care
Han, X., Zhao, J., Ruddy, K. J., Lin, C. C., Sineshaw, H. M., & Jemal, A. (2018). The impact of dependent coverage expansion under the Affordable Care Act on time to breast cancer treatment among young women. <i>PloS one</i> , 13(6).	NCDB	19-25	431	26-34	6745	2007-2009	2011-2013	≠ No effect on cancer related treatment delays (i.e. time to treatment)

Table 2-3 Continued

Article	Data source	Treatment		Comparison		Time Period		Key Findings
		Age group	Sample Size	Age group	Sample Size	Pre DCP	Post DCP	
Wallace, J., & Sommers, B. D. (2015). Effect of dependent coverage expansion of the Affordable Care Act on health and access to care for young adults. <i>JAMA pediatrics</i> , 169(5), 495-497.	BRFSS	19-25	142356	26-34	1214610	3/30/2010 - 9/22/2010	9/23/2010 - 12/2012	- Reduced inability to visit physician due to cost

+ Indicates statistically significant increase

- Indicates statistically significant decrease

≠ Not significant

Table 2-4 Studies of the Effects of the Dependent Coverage Provision on Healthcare-related Expenditures

Article	Data source	Treatment		Comparison		Time Period		Key Findings
		Age group	Sample Size	Age group	Sample Size	Pre DCP	Post DCP	
Ali, M. M., Chen, J., Mutter, R., Novak, P., & Mortensen, K. (2016). The ACA's dependent coverage expansion and out-of-pocket spending by young adults with behavioral health conditions. <i>Psychiatric Services</i> , 67(9), 977-982.	MEPS	19-25	1158	27-29	618	2008-2009	2011-2012	- Reduction in Proportion of Costs Paid OOP for Individuals with Behavioral Health Disorders
Busch, S. H., Golberstein, E., & Meara, E. (2014). ACA dependent coverage provision reduced high out-of-pocket health care spending for young adults. <i>Health affairs</i> , 33(8), 1361-1366.	MEPS	19-25	15427	26-29	8617	2007-2009	2011	- Reduction in high OOP medical expenditures
Chen, J., Bustamante, A. V., & Tom, S. E. (2015). Health care spending and utilization by race/ethnicity under the Affordable Care Act's dependent coverage expansion. <i>American journal of public health</i> , 105(S3), S499-S507	MEPS	19-26	9327	27-30	4982	2008-2009	2011-2012	≠ No effect on OOP as share of total medical expenditure
Look, K. A., & Arora, P. (2016). Effects of the Affordable care act's young adult insurance expansion on prescription drug insurance coverage, utilization, and expenditures. <i>Research in Social and Administrative Pharmacy</i> , 12(5), 682-698.	MEPS	19-25	4863	27-30	2892	2009	2011	- Reduction in total prescription drug expenditures paid OOP
Pakyz, A., Wang, H., & Cunningham, P. (2017). Impact of Health Reform on Young Adult Prescription Medication Utilization. <i>American Journal of Managed Care</i> , 23(11), 670-676.	MEPS	19-25	19165	26-34	23892	2007-2009	2011-2013	- Reduction in share of total prescription expenditures paid OOP
Chua, K. P., & Sommers, B. D. (2014). Changes in health and medical spending among young adults under health reform. <i>Jama</i> , 311(23), 2437-2439.	MEPS	19-25	26453	26-34	34052	2002-2009	2011	- Reduction in OOP as share of total medical expenditure

+ Indicates statistically significant increase

- Indicates statistically significant decrease

≠ Not significant

Table 2-5 Studies of the Effects of the Dependent Coverage Provision on Emergency Department Visits

Article	Data source	Treatment		Comparison		Time Period		Key Findings
		Age group	Sample Size	Age group	Sample Size	Pre DCP	Post DCP	
Antwi, Y. A., Moriya, A. S., Simon, K., & Sommers, B. D. (2015). Changes in emergency department use among young adults after the Patient Protection and Affordable Care Act's dependent coverage provision. <i>Annals of emergency medicine</i> , 65(6), 664-672.	NEDS	19-25	12309030 ED visits	27-29	4987378 ED visits	2007-2009	2011	- Decrease in rate of ED visits
Amuedo-Dorantes, C., & Yaya, M. E. (2013). The Impact of the ACA's Extension of Coverage to Dependents on Young Adults' Access to Care.	NHIS	19-25	24140	26-29	16814	2002-9/2010	10/2010-2011	≠ No effect on ED visits
Chen, J., Bustamante, A. V., & Tom, S. E. (2015). Health care spending and utilization by race/ethnicity under the Affordable Care Act's dependent coverage expansion. <i>American journal of public health</i> , 105(S3), S499-S507.	MEPS	19-26	9327	27-30	4982	2008-2009	2011-20012	≠ No effect on ED visits
Coupet, E., Werner, R. M., Polsky, D., Karp, D., & Delgado, M. K. (2020). Impact of the Young Adult Dependent Coverage Expansion on Opioid Overdoses and Deaths: a Quasi-Experimental Study. <i>Journal of General Internal Medicine</i> , 1-6.	NEDS	23-25	56063	27-29	52189	2009	2011-2013	≠ No effect on rate of ED visits for opioid overdose
Golberstein, E., Busch, S. H., Zaha, R., Greenfield, S. F., Beardslee, W. R., & Meara, E. (2015). Effect of the Affordable Care Act's young adult insurance expansions on hospital-based mental health care. <i>American Journal of Psychiatry</i> , 172(2), 182-189.	California State ED Database	19-25	982,167 ED Visits	26-29	595,683 ED Visits	1/2005-4/2010	9/2010-12/2011	- Decrease in psychiatric ED visits
Hernandez-Boussard, T., Morrison, D., Goldstein, B. A., & Hsia, R. Y. (2016). Relationship of Affordable Care Act implementation to emergency department utilization among young adults. <i>Annals of emergency medicine</i> , 67(6), 714-720.	State ED Databases from Florida, New York, and California	19-25	5,684,714 ED Visits	26-31	4,473,540 ED Visits	9/2009-8/2010	1/2011-12/2011	- Decrease in rates of ED visits
Jhamb, J., Dave, D., & Colman, G. (2015). The Patient Protection and Affordable Care Act and the utilization of health care services among young adults. <i>International Journal of Health and Economic Development</i> , 1(1), 8.	NHIS	19-25	21993	27-33	26750	2005-2009	2011-2013	≠ No effect on number of ED visits
Kozloff, N., & Sommers, B. D. (2017). Insurance Coverage and Health Outcomes in Young Adults With Mental Illness Following the Affordable Care Act Dependent Coverage Expansion. <i>The Journal of clinical psychiatry</i> , 78(7), e821-e827	NSDUH	19-25	19051	26-34	7958	2008-2009	2011-2013	≠ No effect on ED visits

Table 2-5 Continued

Article	Data source	Treatment		Comparison		Time Period		Key Findings
		Age group	Sample Size	Age group	Sample Size	Pre DCP	Post DCP	
Yanuck, J., Hicks, B., Anderson, C., Billimek, J., Lotfipour, S., & Chakravarthy, B. (2017). The Affordable Care Act: Disparities in emergency department use for mental health diagnoses in young adults. <i>World journal of emergency medicine</i> , 8(3), 206.	CA State Emergency Department Database	19-25	158873 ED visits	27-31	109532 ED visits	2009-2010	2011	- Decrease in rate of psychiatric ED visits

+ Indicates statistically significant increase

- Indicates statistically significant decrease

≠ Not significant

Table 2-6 Studies of the Effects of the Dependent Coverage Provision on Hospital Stays

Article	Data source	Treatment		Comparison		Time Period		Key Findings
		Age group	Sample Size	Age group	Sample Size	Pre DCP	Post DCP	
Antwi, Y. A., Moriya, A. S., & Simon, K. I. (2015). Access to health insurance and the use of inpatient medical care: Evidence from the Affordable Care Act young adult mandate. <i>Journal of health economics</i> , 39, 171-187.	NIS	19-25	736,969 Admits	27-29	377345 Admits	1/2007-3/2010	9/2010-12/2011	+ Increase in inpatient and psychiatric inpatient admissions. ≠ No effect on intensity of psychiatric treatment.
Chen, J., Bustamante, A. V., & Tom, S. E. (2015). Health care spending and utilization by race/ethnicity under the Affordable Care Act's dependent coverage expansion. <i>American journal of public health</i> , 105(S3), S499-S507.	MEPS	19-26	9327	27-30	4982	2008-2009	2011-2012	≠ No effect on having ≥1 hospital visit
Chua, K. P., & Sommers, B. D. (2014). Changes in health and medical spending among young adults under health reform. <i>Jama</i> , 311(23), 2437-2439.	MEPS	19-25	26453	26-34	34052	2002-2009	2011	≠ No effect on having ≥1 hospital visit
Golberstein, E., Busch, S. H., Zaha, R., Greenfield, S. F., Beardslee, W. R., & Meara, E. (2015). Effect of the Affordable Care Act's young adult insurance expansions on hospital-based mental health care. <i>American Journal of Psychiatry</i> , 172(2), 182-189.	NIS	19-25	1329051 admits	26-29	807452 admits	1/2005-4/2010	9/2010-12/2011	+ Increase in rate of psychiatric admissions
	CA State Inpatient Database	19-25	150,010 Admits	26-29	104,654 Admits	1/2005-4/2010	9/2010-12/2011	≠ No effect on rate of psychiatric admissions
Shane, D. M., & Ayyagari, P. (2014). Will health care reform reduce disparities in insurance coverage? Evidence from the dependent coverage mandate. <i>Medical care</i> , 528-534.	MEPS	19-25	15765	27-34	18454	2006-2009	2012	≠ No effect on inpatient hospital stays

Table 2-6 Continued

Article	Data source	Treatment		Comparison		Time Period		Key Findings
		Age group	Sample Size	Age group	Sample Size	Pre DCP	Post DCP	
Scott, J. W., Sommers, B. D., Tsai, T. C., Scott, K. W., Schwartz, A. L., & Song, Z. (2015). Dependent coverage provision led to uneven insurance gains and unchanged mortality rates in young adult trauma patients. <i>Health Affairs</i> , 34(1), 125-133.	National Trauma Databank	19-25	246282 encounters	26-34	217886 encounters	2007-2009	2011-2012	≠ No effect on ICU length of stay
Zogg, C. K., Chew, F. P., Scott, J. W., Wolf, L. L., Tsai, T. C., Najjar, P., ... & Canner, J. K. (2016). Implications of the Patient Protection and Affordable Care Act on insurance coverage and rehabilitation use among young adult trauma patients. <i>JAMA surgery</i> , 151(12), e163609-e163609.	Maryland Health Services Cost Review Commission data	18-25	19216 encounters	26-34	16932 encounters	1/2008-9/2010	1/2011-9/2013	≠ No effect on utilization of hospital rehabilitation services among trauma patients
Zogg, C. K., Scott, J. W., Davis, K. A., Dimick, J. B., & Haider, A. H. (2018). Impact of Affordable Care Act Insurance Expansion on Access to Care: Changes in Perforated Appendix Rates among Adults after Medicaid Expansion and the Dependent Coverage Provision. <i>Journal of the American College of Surgeons</i> , 227(4), S148.	State inpatient Databases (FL, NE, NC, TX, CO, IL, MN, NJ, NM)	19-25	119684 Admits	26-34	122307 Admits	1/2008-9/2010	1/2011-9/2013	- Decrease in rate of hospital admission for perforated appendix
Scott, J. W., Rose, J. A., Tsai, T. C., Zogg, C. K., Shrimo, M. G., Sommers, B. D., ... & Haider, A. H. (2016). Impact of ACA insurance coverage expansion on perforated appendix rates among young adults. <i>Medical care</i> , 54(9), 818.	NIS	19-25	52116	26-34	58436	2006-2010	2011-2012	- Decrease in rate of hospital admission for perforated appendix

+ Indicates statistically significant increase

- Indicates statistically significant decrease

≠ Not significant

Table 2-7 Studies on the Effects of the Dependent Coverage Provision on Utilization of Routine, Primary, or Preventative Care

Article	Data source	Treatment		Comparison		Time Period		Key Findings
		Age group	Sample Size	Age group	Sample Size	Pre DCP	Post DCP	
Chen, J., Bustamante, A. V., & Tom, S. E. (2015). Health care spending and utilization by race/ethnicity under the Affordable Care Act's dependent coverage expansion. <i>American journal of public health, 105</i> (S3), S499-S507.	MEPS	19-26	9327	27-30	4982	2008-2009	2011-2012	≠ No effect on having ≥1 physician visit
Chua, K. P., & Sommers, B. D. (2014). Changes in health and medical spending among young adults under health reform. <i>Jama, 311</i> (23), 2437-2439.	MEPS	19-25	26453	26-34	34052	2002-2009	2011	≠ No effect on having ≥1 physician visit ≠ No effect on prescription medicine fill
Han, X., Yabroff, K. R., Robbins, A. S., Zheng, Z., & Jamal, A. (2014). Dependent coverage and use of preventive care under the Affordable Care Act. <i>The New England journal of medicine, 371</i> (24), 2341.	MEPS	19-25	10150	26-30	7044	2009	2011-2012	+ Increase in blood pressure measurement ≠ No effect on flu vaccination ≠ No effect on PAP test ≠ No effect on routine check-up
Jhamb, J., Dave, D., & Colman, G. (2015). The Patient Protection and Affordable Care Act and the utilization of health care services among young adults. <i>International Journal of Health and Economic Development, 1</i> (1), 8.	NHIS	19-25	21993	27-33	26750	2005-2009	2011-2013	+ Increase in number of doctors' office visits (past year)
Kotagal, M., Carle, A. C., Kessler, L. G., & Flum, D. R. (2014). Limited impact on health and access to care for 19-to 25-year-olds following the Patient Protection and Affordable Care Act. <i>JAMA pediatrics, 168</i> (11), 1023-1029.	BRFSS	19-25	Not reported	26-34	Not reported	2009	2012	≠ No effect on physical exam
	NHIS	19-25	Not reported	26-34	Not reported	2009	2012	≠ No effect on flu shot
Lau, J. S., Adams, S. H., Park, M. J., Boscardin, W. J., & Irwin, C. E. (2014). Improvement in preventive care of young adults after the Affordable Care Act: the Affordable Care Act is helping. <i>JAMA pediatrics, 168</i> (12), 1101-1106.	MEPS	18-25	7485	No control	NA	2009	2011	+ Increased rates of cholesterol screenings ≠ No effect on blood pressure screening ≠ No effect flu vaccine ≠ No effect physical exam
Shane, D. M., & Ayyagari, P. (2014). Will health care reform reduce disparities in insurance coverage? Evidence from the dependent coverage mandate. <i>Medical care, 52</i> 8-534.	MEPS	19-25	15765	27-34	18454	2006-2009	2012	≠ No effect on having ≥1 physician visit ≠ No effect on prescription drug fills
Tumin, D., Li, S. S., Kopp, B. T., Kirkby, S. E., Tobias, J. D., Morgan, W. J., & Hayes Jr, D. (2017). The effect of the affordable care act dependent coverage provision on patients with cystic fibrosis. <i>Pediatric pulmonology, 52</i> (4), 458-466.	Cystic Fibrosis (CF) Foundation Patient Registry	18-25	4024	26-35	3132	2007-2009	2011-2013	≠ No effect on use of routine care
Wallace, J., & Sommers, B. D. (2015). Effect of dependent coverage expansion of the Affordable Care Act on health and access to care for young adults. <i>JAMA pediatrics, 169</i> (5), 495-497.	BRFSS	19-25	142356	26-34	1214610	3/30/2010 - 9/22/2010	9/23/2010-2012	≠ No effect on physical exam

Table 2-7 Continued

Article	Data source	Treatment		Comparison		Time Period		Key Findings
		Age group	Sample Size	Age group	Sample Size	Pre DCP	Post DCP	
Look, K. A., & Arora, P. (2016). Effects of the Affordable care act's young adult insurance expansion on prescription drug insurance coverage, utilization, and expenditures. <i>Research in Social and Administrative Pharmacy</i> , 12(5), 682-698.	MEPS	19-25	4863	27-30	2892	2009	2011	≠ No effect on prescription drug utilization
Barbaresco, Silvia, Charles J. Courtemanche, and Yanling Qi. "Impacts of the Affordable Care Act dependent coverage provision on health-related outcomes of young adults." <i>Journal of health economics</i> 40 (2015): 54-68.	BRFSS	23-25	49502	27-29	68892	1/2007 - 9/2010	10/2010 - 12/2013	≠ No effect on flu shot
Wong, C. A., Ford, C. A., French, B., & Rubin, D. M. (2015). Changes in young adult primary care under the affordable care act. <i>American journal of public health</i> , 105(S5), S680-S685	MEPS	19-25	23,396 person-years	No control	N/A	2006-2009	2011-2012	+ Increase in routine check-up

+ Indicates statistically significant increase

- Indicates statistically significant decrease

≠ Not significant

Table 2-8 Studies of the Effects of the Dependent Coverage Provision on Utilization of Behavioral Health Treatment

Article	Data source	Treatment		Comparison		Time span		Key Findings
		Age group	Sample Size	Age group	Sample Size	Pre DCP	Post DCP	
Breslau, J., Stein, B. D., Yu, H., Burns, R. M., & Han, B. (2019). Impacts of the dependent care expansion on the allocation of mental health care. <i>Administration and Policy in Mental Health and Mental Health Services Research</i> , 46(1), 82-90.	NSDUH	19-25	4454	26-34	6605	2008 -9/2010	10/2010-2013	+Increase in use of any mental health treatment
Chavez, L. J., Kelleher, K. J., Matson, S. C., Wickizer, T. M., & Chisolm, D. J. (2018). Mental health and substance use care among young adults before and after Affordable Care Act (ACA) implementation: A rural and urban comparison. <i>The Journal of Rural Health</i> , 34(1), 42-47.	NSDUH	18-25	23470	No control	NA	2008-2010	2011-2014	+Increase in any mental health treatment
	NSDUH	18-25	16012	No control	NA	2008-2010	2011-2014	≠ No effect on substance use disorder treatment
Kozloff, N., & Sommers, B. D. (2017). Insurance Coverage and Health Outcomes in Young Adults With Mental Illness Following the Affordable Care Act Dependent Coverage Expansion. <i>The Journal of clinical psychiatry</i> , 78(7), e821-e827.	NSDUH	19-25	19051	26-34	7958	2008-2009	2011-2013	+ Increase in any outpatient mental health treatment ≠ No effect on inpatient mental health treatment or mental health prescriptions ≠ No effect on substance use disorder treatment
Saloner, B., & Lê Cook, B. (2014). An ACA provision increased treatment for young adults with possible mental illnesses relative to comparison group. <i>Health Affairs</i> , 33(8), 1425-1434.	NSDUH	18-25	13897	26-35	Not reported	2008-2010	2011-2012	+ Increased use of any mental health treatment
	NSDUH	18-25	14705	26-35	Not reported	2008-2010	2011-2012	≠ No effect on substance use disorder treatment
Saloner, B., Akosa Antwi, Y., Maclean, J. C., & Cook, B. (2018). Access to health insurance and utilization of substance use disorder treatment: Evidence from the Affordable Care Act dependent coverage provision. <i>Health economics</i> , 27(1), 50-75.	TEDS	21-24	1,708,104 (both tx and control)	30-34	1,708,104 (both treatment and control)	2007-2009	2011-2013	- Decline in use of substance use disorder treatment (alcohol and drugs)
Carrillo, C. (2019). The Effect of the Dependent Coverage Provision of the Affordable Care Act on Opioid Use and Abuse.	NSDUH	22-25	2,457	26-29	697	2008-2010	2011-2014	+ Increase in substance use disorder treatment received in outpatient setting

+ Indicates statistically significant increase
 - Indicates statistically significant decrease
 ≠ Not significant

Table 2-9 Studies of the Effects of the Dependent Coverage Provision on Utilization of Sexual and Reproductive Healthcare

Article	Data source	Treatment		Comparison		Time Period		Key Findings
		Age group	Sample Size	Age group	Sample Size	Pre DCP	Post DCP	
Eliason, E. (2019). The effects of the dependent coverage provision on young women's utilization of sexual and reproductive health services. <i>Preventive Medicine, 129</i> , 105863.	National Survey of Family Growth data	19-25	3615	27-34	4034	2006-2009	2011-2013	≠ No effect on sexual/reproductive healthcare utilization for birth control method or prescription ≠ No effect on birth control counseling or information ≠ No effect on check-ups or medical test related to birth control ≠ No effect on service utilization for STDs
Han, X., Yabroff, K. R., Robbins, A. S., Zheng, Z., & Jamal, A. (2014). Dependent coverage and use of preventive care under the Affordable Care Act. <i>The New England journal of medicine, 371(24)</i> , 2341.	MEPS	19-25	10150	26-30	7044	2009	2011-2012	- No effect on reception of PAP test
Lipton, B. J., & Decker, S. L. (2015). ACA provisions associated with increase in percentage of young adult women initiating and completing the HPV vaccine. <i>Health affairs, 34(5)</i> , 757-764.	NHIS	19-25	7975	18 or 26	2035	1/2008-9/2010	10/2010-12/2012	+ Increased HPV vaccine initiation and completion
Daw, J. R., & Sommers, B. D. (2018). Association of the Affordable Care Act dependent coverage provision with prenatal care use and birth outcomes. <i>Jama, 319(6)</i> , 579-587.	CDC public-use nativity file	24-25	1379005 births	27-28	1551192 births	2009	2011 - 2013	+ Increase in early prenatal care, Increase in adequate prenatal care
Li, R., Bauman, B., D'angelo, D. V., Harrison, L. L., Warner, L., Barfield, W. D., & Cox, S. (2019). Affordable Care Act-dependent insurance coverage and access to care among young adult women with a recent live birth. <i>Medical care, 57(2)</i> , 109-114.	Pregnancy Risk Assessment Monitoring System	18-25	22599	27-31	22361	1/2009-2/2010	1/2011-12/2013	+ Increase in receipt of timely prenatal care, No effect on postpartum check-up ≠ No effect on postpartum contraception use
Smith, A. J. B., & Fader, A. N. (2018). Effects of the Affordable Care Act on young women with gynecologic cancers. <i>Obstetrics & Gynecology, 131(6)</i> , 966-976.	NCDB	21-26	3971	27-35	20238	2006-2009	2011-2014	≠ No effect on fertility sparing treatment for gynecologic cancer
Robbins, A. S., Han, X., Ward, E. M., Simard, E. P., Zheng, Z., & Jemal, A. (2015). Association between the Affordable Care Act dependent coverage expansion and cervical cancer stage and treatment in young women. <i>Jama, 314(20)</i> , 2189-2191.	NCDB	19-25	650	26-34	5767	2007-2009	2011-2012	+ Increase in fertility sparing treatment for cervical cancer

Table 2-9 Continued

Article	Data source	Treatment		Comparison		Time Period		Key Findings
		Age group	Sample Size	Age group	Sample Size	Pre DCP	Post DCP	
Agénor, M., Murchison, G. R., Chen, J. T., Bowen, D. J., Rosenthal, M. B., Haneuse, S., & Austin, S. B. (2020). Impact of the Affordable Care Act on human papillomavirus vaccination initiation among lesbian, bisexual, and heterosexual US women. <i>Health Services Research, 55</i> (1), 18-25.	National Survey of Family Growth	15-25	7033	No control	N/A	2006-2010	2011-2015	+ Increase in HPV vaccine initiation among bisexual and lesbian women

+ Indicates statistically significant increase
 - Indicates statistically significant decrease
 ≠ Not significant

Table 2-10 Studies on the Effects of the Dependent Coverage Provisions on Utilization of Dental care

Article	Data source	Treatment		Comparison		Time Period		Key Findings
		Age group	Sample Size	Age group	Sample Size	Pre DCP	Post DCP	
Vujcic, M., Yarbrough, C., & Nasseh, K. (2014). The effect of the Affordable Care Act's expanded coverage policy on access to dental care. <i>Medical Care, 52</i> (8), 715-719.	NHIS	19-25	38204* Total sample	26-34	38204* Total sample	2008-2010	2011,2012	+ Increase in dental care utilization
Han, X., Yabroff, K. R., Robbins, A. S., Zheng, Z., & Jamal, A. (2014). Dependent coverage and use of preventive care under the Affordable Care Act. <i>The New England journal of medicine, 371</i> (24), 2341.	MEPS	19-25	10150	26-30	7044	2009	2011-2012	+ Increase in dental check-ups
Lau, J. S., Adams, S. H., Park, M. J., Boscardin, W. J., & Irwin, C. E. (2014). Improvement in preventive care of young adults after the Affordable Care Act: the Affordable Care Act is helping. <i>JAMA pediatrics, 168</i> (12), 1101-1106.	MEPS	18-25	7485	No control	NA	2009	2011	+ Increase in annual dental visits
Shane, D. M., & Wehby, G. (2017). The impact of the Affordable Care Act's dependent coverage mandate on use of dental treatments and preventive services. <i>Medical care, 55</i> (9), 841.	MEPS	25	2727	27	2720	2006-2009	2011-2013	+ Increase in any dental treatment, ≠ No effect on preventative dental services

+ Indicates statistically significant increase
 - Indicates statistically significant decrease
 ≠ Not significant

CHAPTER III

EXAMINING THE IMPACT OF THE DEPENDENT COVERAGE PROVISION ON ACCESS TO AND UTILIZATION OF MENTAL HEALTH SERVICES AMONG YOUNG ADULTS LIVING IN URBAN AND RURAL AREAS

Background

Mental disorders account for a significant proportion of the disease burden in young people, and are associated with increased mortality, substantial disability, and significant societal and economic impact.¹⁻³ The prevalence of mental illness in adolescents and young adults is high, with half of all mental disorders *emerging* before the age of 14, and 75 percent by the age of 25.⁴ To compound this public health problem, many young adults with mental health disorders remain untreated due to high rates of uninsurance and inability to afford treatment costs.⁴⁻⁵

In an effort to reduce healthcare disparities, the ACA's Dependent Coverage Provision (DCP) sought to expand insurance coverage among young people by requiring insurers to extend dependent coverage eligibility until age 26.⁶ Evidence suggests insurance coverage increased for young adults in both urban and rural areas as a result of the DCP.^{7,8} Several studies have found that the DCP had a positive impact on use of mental health treatment among young adults with mental health problems⁹⁻¹³, however it is unclear whether these changes differed by urban-rural residence.

Compared to urban dwellers, rural residents face significant disparities in access to mental health services due to chronic shortages of mental health providers.¹⁴⁻¹⁶ In fact, over 85 percent of Mental Health Professional Shortage Areas are located in rural areas

of the U.S.¹⁵ This scarcity of mental health providers often results in longer travel distances for rural patients, further reducing the likelihood of receiving appropriate and timely mental healthcare.^{14,17} To further compound the problem, rural residents have higher rates of unemployment, poverty, and uninsurance and compared to their urban counterparts, and therefore face greater financial burdens from out-of-pocket costs for mental healthcare.^{15,18-20} Thus, opportunities for expanded insurance coverage through the DCP may have been especially advantageous for young adults living in rural and remote areas across the U.S. Alternatively, the benefits of expanded coverage could also bypass rural residents due the significant access barriers to reception of specialty mental health treatment services in rural areas, as mentioned above.

To our knowledge, only one study has examined rural-urban differences in mental health treatment rates in young adults following the DCP.¹³ However, this study only reported urban and rural trends in behavioral health treatment utilization among 19-25 year olds over time.¹³ More importantly, this study did not include a comparison group, and therefore could not make any causal conclusions about urban-rural effects of the DCP on utilization of mental health treatment services.¹³ To address this knowledge gap, we examine the following research questions:

- 1.) To what extent did the DCP impact utilization of mental health treatment services among young adults residing in rural versus urban areas?
- 2.) To what extent did the DCP impact access to mental health treatment services among young adults residing in rural versus urban areas?

This study adds to the literature by providing novel insights on the differential effects of the DCP on access to and utilization of mental health treatment services among adults living in rural and urban areas of the United States. We utilize a quasi-experimental approach^{21,22} to compare pre-post DCP implementation changes in measures of access and utilization of mental health treatment services among young adults aged 19-25 compared to slightly older cohort of individuals aged 26-34, highlighting how these changes vary by urban-rural residence. The control group was selected because people ages 26–34 faced roughly similar social and economic conditions as those 19–25, but their eligibility for insurance coverage was unaffected by the DCP.

Methods

We used publicly available data from the 2007-2014 National Survey on Drug Use and Health (NSDUH), a nationally representative, annual survey of drug and alcohol use behaviors, mental health status, and behavioral health treatment among the civilian noninstitutionalized U.S. population age twelve or older.²³ Survey participants are selected through a stratified random sample of addresses and answer questions using audio computer-assisted self-interviewing. We utilized 8 years of data, from 2007-2014 assess trends in access and utilization of mental health treatment services before (2007-2010) and after (2011-2014) implementation of the DCP. To provide nationally representative estimates, we applied survey weights to adjust for differential sampling and nonresponse rates.

Study Population

The study population included individuals between the ages of 19-34 who were likely to have a mental illness as determined by the Kessler Psychological Distress Scale-6.²⁴ We separate our study population into two cohorts to represent a treatment and comparison group. The treatment group includes young adults aged 19-25 years who were primarily impacted by the DCP, while the control group will include a group of slightly older individuals aged 26-34 years. The control group was selected because people ages 26–34 faced roughly similar social and economic conditions as those 19–25, but their eligibility for insurance coverage was unaffected by the DCP. Similar control and treatment groups have been used in prior published studies on impacts of the DCP.⁷⁻

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Identification of Mental Health Cases

The NSDUH identifies people with possible mental illness using the Kessler Psychological Distress Scale-6 (K6), a well-validated clinical measure of psychological symptoms.²⁴ The K6 is a 6-item scale is used to assess symptoms of general psychological distress in the preceding 12 months. More specifically, the K6 measures the frequency of symptoms related to nervousness, tiredness, hopelessness, worthlessness, and restlessness in the past year.^{24,25} For example, the K6 includes questions such as “During the last 12 months, about how often did you feel fidgety or restless?” Each K6 item is answered on a 5-point Likert-type scale, where score for each item ranges from 0 (“none of the time”) to 4 (“all of the time”).²⁶ Respondents were

considered to have past-year serious psychological distress (SPD) if their K6 screening score was 13 or more points, which is highly correlated with serious mental illness.²⁴⁻²⁶

Primary Outcomes

The primary outcomes of interest are 1.) use of any mental health treatment in the previous twelve months and 2.) cost-related barriers to reception on mental health treatment in past 12 months. Mental health treatment includes use of any inpatient or outpatient mental health treatment services, or use of any prescription medication for mental health treatment. Cost-related barriers to receiving mental health treatment were defined as reported inability to receive needed mental health treatment due to: unable to afford treatment costs, insurance does not cover treatment, insurance does not cover all of treatment.

Secondary Outcomes

The DCP could also change the setting in which mental health treatment is received (especially for the previously uninsured), as increases in private insurance coverage could lead to a shift from safety-net providers to specialty and private providers.³²⁻³⁴ We perform a series of secondary analyses to explore whether the DCP had an effect on the setting or specific type of treatment received. Treatment types/settings include inpatient, prescription medication, or outpatient care (including outpatient care received at a private doctor's office, private therapist, mental health clinic, or medical clinic). We also include variables for insurance status (private insurance, Medicaid, or no insurance) and payment source for past year treatment services (paid by private insurance, paid by Medicaid, paid without insurance).

Following prior literature, we examined both insurance status and treatment payment source, which allows us to examine whether newly insured patients were able to use their insurance to cover treatment costs.²⁶

Independent Variables

For the 2002-2014 NSDUHs, the respondent's area of residence was determined based on the 2003 Rural-Urban Continuum Codes, developed by the U.S. Department of Agriculture.²⁴ The NSDUH further categorizes county type into three groups based on Office of Management and Budget definitions for metropolitan and micropolitan statistical areas - 1) large metropolitan (population \geq 1 million), 2) small metropolitan (population $<$ 1million), and 3) nonmetropolitan (locations outside of metropolitan statistical areas).²⁷ For our analyses, large and small metropolitan areas are considered "urban", and nonmetropolitan areas are considered "rural" areas.

We also include a number of demographic covariates, including sex, race/ethnicity (white, black, Hispanic, Native American, Asian/Hawaiian Pacific Islander, other), marital status (married, divorced, widowed, never married), health status (excellent, very good, good, fair, poor), level of education (less than a high school diploma, high school graduate, some college, and college graduate), and employment status (part time, full time, unemployed, not in labor force/other).

Empirical Model

While randomized controlled trials are considered as the gold standard for evaluating causal relationships, they are not always appropriate for health policy evaluations due to financial, feasibility, or ethical concerns.^{21,22,28} In these cases,

researchers commonly rely on observational studies as an alternative method to assess the effect of a policy or intervention.²⁴⁻²⁶ Still, in the absence of random assignment, observational studies are particularly vulnerable to the influence of bias and unmeasured confounding. We addressed this challenge by utilizing difference in differences (DD) approach, a quasi-experimental study design derived from the fields of economics, sociology, and political science.^{21,22,28,29}

The DD approach is used to estimate the effect of a particular intervention (such as a passage of law or enactment of policy) by comparing changes in outcomes over time between a group expected to be affected by the policy change (i.e. the “target group”) relative to a group that was not affected by the policy change (i.e. the “comparison group”).^{21,22,29} The DD approach assumes that in the absence of the treatment (i.e. DCP policy change), trends in the outcome(s) of interest would be the same in both the treatment and comparison groups. Therefore, the differences between changes in the exposed group relative to the unexposed group represent changes that occurred as a result of the specific intervention or policy change.^{21,22,28,29}

To identify the impact of the DCP on access to and utilization of mental health treatment, we begin with a difference-in-differences (DD) framework, comparing changes in outcomes among a target population of 19-25 year olds, relative to a slightly older comparison group of 26-34 year olds, before (2007-2010) and after (2011-2014) DCP implementation. We present 3 separate DD models to explore the DCPs impact from a national perspective, and within rural and urban populations, using the following DD regression equation:

$$Y_{gt} = \alpha + \beta_1 Treatment_g + \beta_2 Post_t + \beta_3 (Treatment_g * Post_t) + \eta X_{gmt} + \theta Time_t + \varepsilon$$

In this equation, Y_{gt} represents the mental health outcome for individuals in the treatment/comparison group g for year t . $Treatment$ is a binary variable equal to 1 if the individual is aged between 19-25 years, and equals 0 if the individual is aged 26-34 years. $Post$ is a binary variable equal to 1 if the time period is after the DCP went into effect (2011-2014) and equal to 0 if the time period is before the DCP expansion (2007-2010). The X represents a vector of covariates: gender, marital status, education, employment, health status, and race. $Time$ represents a vector of year-fixed effects. The coefficient β_3 is an estimate of the impact of the DCP expansion on mental health outcomes. A positive sign for DD indicates that the outcome increased more (or decreased less) among 19-25 year olds relative to the changes experienced by the slightly older cohort of 26-34 year olds. A negative sign for DD means that the outcome decreased more (or increased less) among 19-25 year olds relative to 26-34 year olds.

We estimate the impact of the DCP on rural-urban disparities in behavioral health treatment using a triple-difference (DDD) model, an extension of the standard DD model.^{23,29} As mentioned previously, the standard DD approach compares change over time in an intervention group with change over the same period of time in a comparison group unaffected by the policy in question. Therefore, the standard DD approach would be appropriate if we only wanted to compare outcomes for adults aged 19-25 years versus adults aged 26-34, before and after the DCP went into effect (regardless of urban/rural location). Because we are also interested in the differential effect of the DCP for a specific subgroup (rural populations), we utilize a DDD approach.¹⁸⁻²⁰ For each

outcome, we estimate the differential impact of the DCP between rural and urban populations using following DDD regression equation:

$$Y_{gct} = \alpha + \beta_1 Treatment_g + \beta_2 Post_t + \beta_3 (Treatment_g * Post_t) + \beta_4 (Treatment_g * Post_t * Rural_c) + \eta X_{gmt} + \theta Time_t + \varepsilon$$

In the DDD equation, Y_{gct} represents the Mental Health or SUD outcome for individuals in the treatment/comparison group g in rural category c for year t . $Treatment$ is a binary variable equal to 1 if the individual is aged between 19-25 years, and equals 0 if the individual is aged 26-34 years. $Post$ is a binary variable equal to 1 if the time period is after the DCP went into effect (2011-2014) and equal to 0 if the time period is before the DCP expansion (2007-2010). $Rural$ is a binary variable equal to 1 if the individual lives in a nonmetropolitan county, and equal to 0 if the individual lives in a large or small metropolitan area. The X represents a vector of covariates: gender, marital status, education, employment, health status, and race. $Time$ represents a vector of year-fixed effects. The coefficient β_4 is an estimate of the differential impact of the DCP for individuals living in rural areas. Similar to the DD model, a positive sign for DDD indicates that the outcome increased more (or decreased less) among rural 19-25 year olds compared to rural 26-34 years olds relative to the difference experienced by urban 19-25 year olds vs urban 26-34 over time. A negative sign for DDD indicates the reverse.

Even though our study outcomes are binary, we utilized linear probability models for our DD & DDD analyses, because they typically produce reliable estimates of average effects that are easily interpreted as percentage point changes in study

outcomes.¹⁹ Furthermore, the linear approach avoids complications related to the estimation and interpretation of multiple interaction terms and their standard errors in logit models.^{22,30,31} Several existing studies have leveraged linear probability models for dichotomous outcomes in a DD framework.^{16,32-34} To test the robustness of our results, we will compare results from the linear probability model to an alternate specification of DD & DDD models using logit regressions. Results from both models will be compared and any discrepancies in results across specifications will be reported.³⁵ We used Stata 15 for all statistical analyses and set the significance level at $p < 0.10$. We also used NSDUH survey weights and Stata survey commands for all analyses to account for the complex survey design and to produce nationally representative estimates for the U.S. noninstitutionalized population.

Falsification Tests and Sensitivity Analyses

The validity of the DD approach relies on the parallel trends assumption: that in the absence of the DCP, outcomes in the 26-34 age group would have followed the same trend as those in the 19-25 age group. We assessed the parallel trends assumption by estimating regressions using only data prior to the enactment of the provision in 2010. To do this, we kept the same outcome and control variables, but the key independent variable was an interaction between a linear time trend and the treatment group dummy variable.

Although the DCP went into effect in September of 2010, plans were encouraged to voluntarily begin covering young adults prior to this date.³⁶ Therefore, we will also conduct sensitivity analyses in which we omit the 2010 surveys from the analysis. We

will also conduct sensitivity checks using alternative treatment and comparison groups. To do this, we estimated our models using more narrowed age groups, comparing outcomes using adults ages 22-25 years as our alternative treatment group to those of individuals between 30-34 years as our alternative comparison group. To further assess the validity of our model, we conduct falsification/placebo tests by estimating our regression model using adults ages 50-64 as our treatment group – an age group that was not affected by the DCP. Similar falsification tests and sensitivity analyses have been used in prior peer-reviewed studies examining the impact of the DCP.^{7,33}

Results

Between 2007 and 2014, 124,101 individuals aged 19-25 and 47,774 individuals aged 26-34 participated in the NSDUH survey. Over the same time period, 22,923 individuals aged 19-25 and 6,935 individuals aged 26-35 were identified as having serious psychological distress, an indication of serious mental illness. The estimated proportion of the population with SPD averaged 18.0% for 19-25 year olds, and 13.8% for 26-35-year-olds, and these proportions remained stable throughout the study period (difference-in-difference estimate, -0.10 percentage points [95% CI -1.2 to 1.0, p=0.85]).

Table 3-1 presents summary statistics of individuals with SPD in the treatment (19-25 year olds) and comparison (26-34 year olds) groups for the pre-DCP period (2007-2010) by area of residence (rural vs urban). For all demographic variables except for health status, urban populations differed significantly from rural populations before DCP for both age groups. A lower proportion of rural 19-25 year olds utilized outpatient mental health treatment services in the pre-DCP period, compared to their urban

counterparts in the same age group (54.6 vs 61.3, $p=0.023$). Private insurance coverage was also significantly lower among rural residents compared to urban in the pre DCP period for both the treatment (37.9% vs 51.5%, $p<0.001$) and comparison groups (41.4% vs 54.8%, $p=0.0005$). Similarly, rural residents who received mental health care in the past year were less likely than urban residents to use private insurance to pay for treatment costs, in both the treatment (20.8% vs 33.3, $p=0.0014$) and comparison groups (23.8% vs 43.2%, $p=0.0019$). Lastly, rural residents aged 19-25 had higher rates of uninsurance (40.0% vs 29.6%, $p<0.001$) and cost-related barriers to mental health treatment (57.8% vs 51.8%, $p=0.025$), compared to urban dwellers aged 19-25 years.

Table 3-1. Sample Characteristics of the Study Population in the Pre-DCP Period by Urban and Rural Location using the National Survey on Drug Use and Health 2007-2010.

	Age 19-25		Ages 26-34	
	Estimated mean/proportion (SE)		Estimated mean/proportion (SE)	
	Rural (N=2,423)	Urban ⁺ (N=9,141)	Rural (N=718)	Urban ⁺ (N=2,586)
Sex				
Male	39.1 (1.3)	37.5 (0.7)	37.3 (2.6)	38.4 (1.2)
Race				
White	80.4 (1.3)	62.7 (0.8)***	80.8 (2.2)	64.7 (1.2)***
Black	8.1 (0.7)	12.7 (0.5)***	6.9 (1.2)	13.3 (1.0)**
Asian	0.4 (0.1)	5.0 (0.4)***	0.2 (0.1)	3.7 (0.6)***
Hispanic	7.5 (0.9)	17.1 (0.5)***	9.8 (2.0)	16.0 (1.0)*
Other	3.5 (0.5)	2.5 (0.2)*	2.4 (0.5)	2.2 (0.4)
Marital Status				
Married	15.2 (0.8)	11.1 (0.4)***	42.3 (3.2)	38.4 (1.1)
Widowed	0.2 (0.1)	0.1 (0.05)	1.0 (0.7)	0.5 (0.1)
Divorced	5.1 (0.7)	3.0 (0.2)**	22.7 (2.3)	14.8 (1.0)***
Never Married	79.5 (1.1)	85.8 (0.4)***	34.0 (2.7)	46.3 (1.2)***
Education				
Less than high school diploma	20.4 (1.3)	13.9 (0.5)***	20.0 (2.3)	13.1 (0.8)**
High school grad	39.5 (1.5)	31.5 (0.6)***	37.3 (2.2)	25.0 (1.1)***
Some college	33.7 (1.6)	38.9 (0.8)*	30.7 (2.2)	30.5 (1.2)
College grad	6.4 (0.8)	15.6 (0.6)***	12.0 (1.6)	31.4 (1.3)***
Employment				
Employed full time	39.8 (1.6)	40.5 (0.8)	49.6 (2.5)	58.9 (1.3)**
Employed part time	23.4 (1.1)	27.2 (0.8)*	13.5 (2.1)	13.5 (0.9)
Unemployed	15.3 (1.1)	12.4 (0.5)*	10.6 (1.4)	9.5 (0.6)
Not in labor	21.6 (1.2)	20.0 (0.5)	26.3 (2.1)	18.1 (0.9)***
Health				
Excellent	18.3 (1.1)	19.1 (0.6)	13.5 (1.9)	17.5 (1.0)
Very good	36.0 (1.4)	39.3 (0.7)	37.9 (2.4)	35.6 (0.9)
Good	32.6 (1.2)	30.5 (0.8)	31.7 (2.2)	32.8 (1.5)
Fair/Poor	13.0 (1.0)	11.1 (0.4)	16.9 (2.0)	14.1 (0.9)
Mental health treatment				
Any mental health treatment ^a	30.2 (1.3)	31.0 (0.7)	49.5 (3.0)	43.5 (1.3)
Inpatient	12.0 (2.0)	12.0(0.95)	8.5 (2.2)	10.1 (1.3)
Prescription	83.9 (1.7)	79.9 (1.0)	85.6 (2.6)	85.6 (1.2)
Outpatient	54.6 (2.4)	61.3% (1.1)*	52.2 (2.9)	66.1% (1.8)
Insurance Status				
Private	37.9(1.5)	51.5 (0.7)***	41.4 (3.2)	54.8 (1.3)***
Medicaid	18.1 (1.1)	14.3 (0.5)**	23.9 (2.1)	14.8 (1.0)***
Uninsured	40.0 (1.4)	29.6 (0.6)***	29.8 (2.6)	27.0 (1.2)
Payment for past treatment episode				
Private	20.8 (3.0)	33.3 (1.8)*	23.8 (4.2)	43.2 (2.5)*
Medicaid	17.5 (2.7)	12.0 (1.1)	26.5 (4.9)	12.4 (1.6)**
No insurance	57.8 (4.0)	59.5 (1.7)	41.4 (4.1)	46.1 (2.5)
Cost-related barriers to care	57.8 (2.7)	51.8 (1.4)*	51.7 (4.0)	56.8 (2.6)

⁺Rates were compared with rural populations of the same age group and time period

^a Includes inpatient, prescription, and any outpatient

* p<0.05, ** p<0.01, *** p<0.001

Utilization of Mental Health Treatment

Table 3-2 presents DD & DDD estimates of the DCPs impact on utilization of mental health treatment services. In column 4 of table 3-2, we find that the DCP resulted in a statistically significant 4.77 percentage point increase ($p=0.007$) in use of any mental health treatment among 19-25 year olds with SPD, relative to the comparison group. Specifically, the DCP was associated with significant increases in utilization of outpatient treatment (DD=6.89%, $p<0.001$), but had no effect on prescription drug or inpatient services for mental health treatment. The DCP also changed the setting at which patients received mental health treatment, resulting in increases in treatment received at a private doctor's office (DD=3.97, $p=0.047$) as well as treatment provided by a private therapist (DD=6.76%, $p=0.019$),

Columns 5-7 of table 3-2 present DD estimates of the DCPs effect on mental health treatment use and type/setting of mental health treatment among rural young adults aged 19-25, relative to rural residents aged 26-34. Among rural residents, the DCP resulted in a statistically significant 8.77 percentage point ($p=0.044$) increase in use of any mental health treatment among 19-25 year olds relative to the comparison group (table 3-2 column 7). Despite this, the DCP had no effect on the type or setting at which rural patients received their mental health treatment.

Columns 8-10 of table 3-2 present DD estimates of the DCPs effects on mental health treatment use and type/setting of mental health treatment among urban young adults. As seen in column 10 of table 3-2, urban dwelling 19-25 year olds also experienced a significant increase in use of any mental health treatment (DD=3.97%,

p=0.044) following the DCP. Across treatment types, the DCP significantly increased in use of any outpatient treatment (DD=9.08%, p=0.005), which appeared to be driven by increases in treatment received from a private therapist (DD=8.96%, p=0.010). While urban young adults also experienced a statistically significant increase in utilization of mental health treatment at a private doctors office following the DCP (DD=3.73%, p=0.095) according to our linear probability model, this estimate was no longer statistically significant when estimated using a logit model.

Column 11 of table 3-2 includes DDD estimates of the DCP`s effects on mental health treatment use, reflecting the differential impact of the DCP between urban and rural populations. Here we find that the DCP had a differential impact on use of outpatient mental health treatment, which increased by 11.98 points more in urban areas compared to rural (DDD=-11.98, p=0.08). The differential impact in outpatient service use appears to be driven by urban-rural differences in the use of treatment from a private therapist, which increased by 11.95 percentage points more (DD=-11.95, p=0.065) among urban residents relative to rural residents.

Table 3-2. Impact of DCP on Utilization of Mental Health Treatment Services among 19-25 year olds, compared to 26-34 year olds, estimated from the National Survey on Drug Use & Health 2007-2014

Column #1	Full Sample			Rural			Urban			11 DDD (DD _r - DD _u)
	2 Pre _f	3 Post _f	4 DD _f (Pre _{fi} - Post _{fi}) - (Pre _{fc} - Post _{fc})	5 Pre _r	6 Post _r	7 DD _r (Pre _{ri} - Post _{ri}) - (Pre _{rc} - Post _{rc})	8 Pre _u	9 Post _u	10 DD _u (Pre _{ui} - Post _{ui}) - (Pre _{uc} - Post _{uc})	
Any mental health treatment^a										
19-25	30.9%	33.1%	4.77% (p=0.007)	30.2%	35.7%	8.77% (p=0.044)	31.0%	32.7%	3.97% (p=0.044)	4.53% (p=0.358)
26-34	44.5%	42.7%		49.5%	48.1%		43.5%	41.8%		
Type or setting of mental health treatment used in the past year^b										
Inpatient										
19-25	12.0%	10.6%	0.39% (p=0.835)	12.0%	9.7%	-4.74% (p=0.236)	12.0%	10.7%	1.67% (p=0.426)	-7.04% (p=0.131)
26-34	9.8%	8.2%		8.5%	11.5%		10.1%	7.6%		
Prescription										
19-25	80.5%	76.2%	-2.16% (p=0.254)	83.9%	81.5%	-5.07% (p=0.230)	79.9%	75.2%	-1.58% (p=0.433)	-3.07% (p=0.512)
26-34	85.6%	83.5%		85.6%	88.6%		85.6%	82.6%		
Any outpatient^c										
19-25	60.3%	61.7%	6.89% (p=0.012)	54.6%	50.8%	-3.21% (p=0.539)	61.3%	63.7%	9.08% (p=0.005)	-11.98% (p=0.08)
26-34	63.5%	58.5%		52.2%	53.1%		66.1%	59.6%		
Private doctor										
19-25	9.9%	8.2%	3.97% (p=0.047)	9.4%	8.4%	4.64% (p=0.252)	10.0%	8.1%	3.73% (p=0.095) [^]	0.88% (p=0.850)
26-34	14.4%	8.6%		16.1%	10.7%		13.9%	8.2%		
Private therapist										
19-25	35.6%	39.0%	6.76% (p=0.019)	26.7%	26.1%	-3.09% (p=0.531)	37.1%	41.5%	8.96% (p=0.010)	-11.95% (p=0.065)
26-34	34.7%	31.7%		19.0%	22.3%		38.3%	33.5%		
Mental health clinic										
19-25	15.7%	15.8%	-0.46% (p=0.800)	17.9%	16.9%	-3.21% (p=0.443)	15.3%	15.6%	-0.01% (p=0.997)	-3.09% (p=0.521)
26-34	17.9%	18.9%		19.9%	23.2%		17.4%	18.1%		
Medical clinic										
19-25	5.0%	3.8%	0.32% (p=0.785)	7.4%	4.4%	0.24% (p=0.932)	4.6%	6.7%	0.38% (p=0.780)	-0.37% (p=0.910)
26-34	5.5%	4.2%		5.5%	3.1%		5.5%	4.4%		

^f Estimates derived from full sample (urban + rural, n= 29,858)

^r Estimates limited to rural residents (n= 6,205)

^u Estimates limited to urban residents (n= 23,65)

^a Includes inpatient, prescription, and any outpatient

^b Among those who received any mental health treatment in the past 12 months (N_f= 10,541, N_r= 2,318, N_u= 8,223)

^c Includes outpatient treatment received at private doctor office, private therapist, mental health clinic, or medical clinic

ⁱ Treatment group (19-25 yrs)

^c Control group (26-34 yrs)

[^] Estimate no longer significant in logit specification (p>0.10)

Insurance Status

Table 3-3 presents DD and DDD estimates of the DCP's effect on insurance status among 19-25 year olds with SPD, relative to the comparison group. Columns 2-4 of table 3-3 includes DD estimates for the entire study population. Compared to those aged 26-34, private insurance coverage among individuals aged 19-25 increased significantly by 9.58 percentage points following the DCP ($DD_f=9.58, p>0.001$). Furthermore, the proportion of uninsured 19-25 year olds significantly decreased by 7.65 percentage points ($DD=-7.65, p>0.001$) following the DCP, relative to 26-34 year olds. As expected, the DCP had no impact on the likelihood that past year mental health treatment was paid for by Medicaid among 19-25 year olds, relative to those aged 26-34 years.

Columns 5-7 of table 3-3 present DD estimates of the DCP's effect on insurance status among rural residents aged 19-25 years with SPD, relative to the comparison group. Compared to those aged 26-34, private insurance coverage among individuals aged 19-25 increased significantly by 9.57 percentage points following the DCP ($DD_f=9.57, p=0.036$). Furthermore, the DCP was associated with a significant 17.06 percentage point decrease ($DD_r=-17.06, p>0.001$) in the proportion of uninsured rural young adults, relative to the comparison group. However, Medicaid insurance coverage also significantly increased for rural 19-25 year olds following the DCP ($DD_r=7.15, p=0.032$).

Regression estimates in columns 8-10 of table 3-3 suggest that the DCP was associated with a significant 9.38 percentage point increase in private insurance

coverage among urban 19-25 year olds, relative to urban dwellers aged 26-34 ($DD_u=9.38\%$, $p>0.001$). The DCP was also associated with significant reductions ($DD=-6.09$, $p>0.001$) in the likelihood that past year treatment was paid for without insurance (uninsured) among urban dwelling 19-25 year olds, relative to the comparison group. However, there were no significant changes in the likelihood that past year treatment was paid for by Medicaid for urban 19-25 year olds, relative to the comparison group.

Column 11 of table 3-3 includes DDD estimates, reflecting the differential impact of DCP's effects insurance status among rural and urban individuals who received any mental health treatment in the past year. Here we find that the DCP had a differential impact on uninsurance status, which decreased by 10.64 points more in rural areas relative to urban ($DDD=-10.64$, $p=0.019$). We also find significant DDD estimates for Medicaid coverage, which increased by 8.69 percentage points more among rural residents than urban ($DDD=8.69$, $p=0.018$). No significant urban-rural differences were detected for private insurance status.

Table 3-3. Impact of DCP on Insurance Status among 19-25 year olds vs 26-34 year olds with SPD, estimated from the National Survey on Drug Use & Health 2007-2014

Column #1	Full Sample			Rural			Urban			11
	2 Pre _f	3 Post _f	4 DD _f (Pre _{ft} - Post _{ft}) - (Pre _{fc} - Post _{fc})	5 Pre _r	6 Post _r	7 DD _r (Pre _{rt} - Post _{rt}) - (Pre _{rc} - Post _{rc})	8 Pre _u	9 Post _u	10 DD _u (Pre _{ut} - Post _{ut}) - (Pre _{uc} - Post _{uc})	
Private Insurance										
19-25	49.5%	54.8%	9.58% (p=0.000)	37.9%	46.1%	9.57% (p=0.036)	51.5%	56.3%	9.38% (p=0.000)	0.31% (p=0.951)
26-34	52.6%	47.9%		41.4%	40.5%		54.8%	49.1%		
Medicaid										
19-25	14.9%	16.5%	-0.66% (p=0.602)	18.1%	22.9%	7.15% (p=0.032)	14.3%	15.3%	-2.04% (p=0.135)	8.69% (p=0.018)
26-34	16.2%	18.9%		23.9%	21.7%		14.7%	18.4%		
No Insurance										
19-25	31.2%	23.7%	-7.65% (p=0.000)	40.0%	26.9%	-17.06% (p=0.000)	29.6%	23.1%	-6.09% (p=0.001)	-10.64% (p=0.019)
26-34	27.5%	28.1%		29.8%	33.4%		27.0%	27.2%		

_f Estimates derived from full sample (urban + rural, n= 29,858)

_r Estimates limited to rural residents (n= 6,205)

_u Estimates limited to urban residents (n= 23,653)

_t Treatment group (19-25 yrs)

_c Control group (26-34 yrs)

Payer Source for Mental Health Treatment

Table 3-4 presents DD and DDD estimates of the DCP's effect on payment source for mental health treatment among 19-25 year olds who reported receiving mental health treatment services in the past year, relative to the comparison group. Columns 2-4 of table 3-4 includes DD estimates for the entire study population. Compared to those aged 26-34, individuals aged 19-25 who used mental health treatment in the past year were significantly more likely to report that their treatment was paid for by private insurance following the DCP (DD=12.61, p=0.001). However, there were no significant changes in the likelihood that past year treatment was paid for without insurance (uninsured) for 19-25 year olds, relative to the comparison group. As expected, the DCP

had no impact on the likelihood that past year mental health treatment was paid for by Medicaid among 19-25 year olds, relative to those aged 26-34 years.

Columns 5-7 of table 3-4 present DD estimates of the DCP's effect on payment source among rural residents. Here we find that rural residents aged 19-25 were significantly more likely than rural residents aged 26-34 to report that their past year mental health treatment was paid for by private insurance (DD=14.43%, $p=0.030$). Rural young adults were also significantly less likely than those aged 26-34 to report that their past year mental health treatment was paid for without insurance (uninsured) after DCP implementation (DD=-16.96%, $p=0.038$). However, there were no significant changes in the likelihood that past year treatment was paid for by Medicaid for rural 19-25 year olds, relative to residents aged 26-34.

The DD estimates in columns 8-10 of table 3-4 suggest that urban 19-25 year olds who used mental health treatment in the past year were significantly more likely to report that their treatment was paid for by private insurance following the DCP (DD=12.46%, $p=0.003$). There were no significant changes in the likelihood that past year treatment was paid for without insurance (uninsured) among urban dwelling 19-25 year olds, relative to the comparison group. Furthermore, we observed no significant changes in the likelihood that past year treatment was paid for by Medicaid for urban 19-25 year olds, relative to the comparison group.

In column 11 of table 3-4, we find a significant 17.81 percentage point ($p=0.071$) difference between rural and urban individuals reporting that their past year mental health treatment was paid for without insurance. This suggests that the DCP significantly

reduced the proportion of uninsured mental health treatment use by 17.81 percentage points more in rural areas than in urban areas. However, DDD estimates for probabilities that mental health treatment was paid for by private insurance did not reach statistical significance.

Table 3-4. Impact of DCP on Payer Source for Past Treatment Episode among 19-25 year olds, compared to 26-34 year olds, estimated from the National Survey on Drug Use & Health 2007-2014

Column #1	Full Sample			Rural			Urban			11 DDD (DD _r - DD _u)
	2 Pre _r	3 Post _r	4 DD _r (Pre _{ri} - Post _{ri}) - (Pre _{rc} - Post _{rc})	5 Pre _r	6 Post _r	7 DD _r (Pre _{ri} - Post _{ri}) - (Pre _{rc} - Post _{rc})	8 Pre _u	9 Post _u	10 DD _u (Pre _{ui} - Post _{ui}) - (Pre _{uc} - Post _{uc})	
Paid by private insurance										
19-25	31.6%	36.6%	12.61% (p=0.001)	20.8%	31.0%	14.43% (0.030)	33.3%	37.5%	12.46% (p=0.003)	2.41% (p=0.754)
26-34	40.3%	31.4%		23.8%	16.7%		43.2%	33.9%		
Paid by Medicaid										
19-25	12.72%	11.1%	-1.60% (p=0.497)	17.5%	19.3%	8.90% (p=0.264)	12.0%	9.9%	-3.24% (p=0.196)	9.99% (p=0.248)
26-34	14.6%	16.3%		26.5%	25.1%		12.4%	14.8%		
Paid without insurance ^e										
19-25	59.2%	63.4%	0.36% (p=0.924)	57.8%	57.4%	-16.96% (p=0.038)	59.5%	64.3%	2.98% (p=0.495)	-17.81% (p=0.071)
26-34	45.4%	48.8%		41.4%	52.5%		46.1%	48.2%		

^f Estimates derived from full sample (urban + rural, n= 29,858)
^r Estimates limited to rural residents (n= 6,205)
^u Estimates limited to urban residents (n= 23,65)
ⁱ Treatment group (19-25 yrs)
^c Control group (26-34 yrs)
^e Self- or family insured, or uncompensated care

Cost-related Barriers to Mental Health Treatment

Table 3-5 includes DD & DDD estimates of the DCP's effect on cost-related barriers to mental health treatment among 19-25 year olds who reported a need for mental health treatment but did not receive it. Columns 2-4 of table 3-5 includes DD

estimates for the entire study population, and indicate that the DCP resulted in a significant 8.00 percentage point ($p=0.057$) decrease in cost-related barriers to mental health treatment among 19-25 year olds, compared to those aged 26-34. Similar results were found in the rural subgroup (columns 5-7 of table 3-5), where the DCP was associated with a significant 16.77 percentage point ($p=0.023$) decline in cost-related barriers to mental health treatment. However, there were no significant change in cost-related barriers to mental health treatment among urban dwelling young adults (columns 8-10 of table 3-5). The DDD estimates for cost-related barriers to mental health treatment listed in column 11 of table 3-5 were also not significant, indicating that the DCP did not significantly impact rural-urban disparities in cost-related barriers to mental health treatment.

Table 3-5. Impact of DCP on Cost Related Barriers to Mental Health Treatment among 19-25 year olds, compared to 26-34 year olds, estimated from the National Survey on Drug Use & Health 2007-2014**

Column #1	Full Sample			Rural			Urban			11 DDD (DD _r - DD _u)
	2 Pre _f	3 Post _f	4 DD _f (Pre _f - Post _f) - (Pre _c - Post _c)	5 Pre _r	6 Post _r	7 DD _r (Pre _r - Post _r) - (Pre _c - Post _c)	8 Pre _u	9 Post _u	10 DD _u (Pre _u - Post _u) - (Pre _c - Post _c)	
Cost related barriers to reception of mental health treatment										
19-25	52.7%	48.8%	-8.00% (p=0.057)	57.8%	52.7%	-16.77% (p=0.023)	51.8%	48.1%	-6.53% (p=0.137)	-8.78% (p=0.249)
26-34	56.0%	60.6%		51.7%	62.2%		56.8%	60.3%		

** Among those with SPD who reported a need for mental health treatment but did not receive it

_f Estimates derived from full sample (urban + rural, n= 29,858)

_r Estimates limited to rural residents (n= 6,205)

_u Estimates limited to urban residents (n= 23,65)

_t Treatment group (19-25 yrs)

_c Control group (26-34 yrs)

Falsification and Sensitivity Tests

We estimate several additional models to check the robustness of our results.

First, we examined the parallel trends assumption by estimating regressions using only data prior to the enactment of the provision in 2010. Results from our parallel trends test are included in table B.1 of the Appendix B. Results generally indicate that DD coefficients/estimates for our primary outcomes were either not significant or negative and significant in the pre DCP period. However, we did find positive and significant pre-DCP trends for some treatment types and settings. For example, among rural populations, prescription medication treatment ($DD_r=5.70$, $p=0.037$) and outpatient treatment from a private therapist ($DD_r=6.18$, $p=0.023$) were trending upward in years prior to the DCP, however these trends were no longer significant post-DCP, and did not impact our main results. Additionally, reception of mental health treatment at a medical clinic was trending upward among urban residents prior to the DCP ($DD_u=2.00$, $p=0.053$), however, this finding was no longer significant post DCP, and therefore did not impact our main findings.

In our second falsification test, we estimate models using a “placebo” treatment group consisting of adults ages 50-64– an age group that was not affected by the DCP. As shown in appendix B table B.2, placebo effects are null for nearly all study outcomes. The exception is that estimates for the likelihood that past year mental health treatment was received at a private doctor’s office ($DD_r=4.63$, $p=0.059$) and/or mental health clinic ($DD_r=4.60$, $p=0.070$; $DD_u=5.32$, $p=0.056$) were significant when using our placebo treatment group. However, this finding does not impact our overall study results, as

young adult`s likelihood of receiving mental health treatment at a mental health clinic were not significant in our DD estimates using the full sample, or within rural or urban subpopulations.

To further assess the validity of our model, we conducted two additional sensitivity tests. First, we explored whether results are sensitive to our choice of treatment and comparison groups by estimating models using individuals aged 22-25 as our treatment groups, and those aged 30-34 as our comparison group (Appendix B, table B. 3). We further explored the sensitivity of our results by omitting 2010 surveys from our analysis (Appendix B, table B. 4). Findings from these sensitivity analyses were similar to the results found in our main analyses, with a few exceptions. In terms of payment source for treatment, the likelihood that past year mental health treatment was paid for by Medicaid became positive and significant within the rural subpopulation ($DD_r=9.96$, $p=0.087$) when models were estimated without 2010 surveys. The omission of 2010 surveys also revealed significant reductions in cost related barriers among urban individuals, something that was not significant in our main model ($DD_u=-10.25$, $p=0.021$). In models using alternate treatment and comparison age groups, we found a significant increase in use of treatment at a mental health clinic within the rural subpopulation ($DD_r=9.96$, $p=0.087$). Additionally, the DD coefficient for private insurance status within the rural subpopulation no longer reached statistical significance at the $p>0.10$ level when estimated using alternate age groups.

Discussion

Access to quality health services has been identified as the single most important rural health priority for the decade.³⁷ It is well documented that the DCP generated positive effects on young adult`s access to and utilization of mental treatment services from a national perspective.^{15,16,18,19} To build on this literature, this study provides insights into whether the DCP`s impacts extend to the nation`s rural young adult populations.

Consistent with other studies^{15-20,38}, we found that the DCP increased utilization of mental health treatment services, reduced cost-related barriers to care among all adults, regardless of location of residence. We also found evidence that the DCP impacted the setting at which young people receive mental health treatment, as treatment received at a private therapist or doctor`s office increased significantly following the DCP. Interestingly, the DCP had no effect on use of inpatient mental health treatment services for either rural or urban young adults. Both private insurance status and private insurance payment for mental health treatment also increased for all young adults, providing evidence that newly insured young adults were able to use their insurance to cover mental health treatment costs.

However, when we stratified our models by rural and urban residence, we find that the DCP impacted rural and urban individuals differently. In terms of the DCPs effects on utilization of any mental health treatment, we find that the DCP appeared to be especially beneficial to rural residents, as the magnitude of the DCPs impact on utilization of mental health treatment service among rural young adults was nearly

double those of urban young adults. Additionally, the DCPs impact on uninsurance rates among rural residents were nearly triple those of urban young adults. This resulted in a significant DDD estimate, indicating rural residents experienced greater reductions in the number of uninsured young adults compared to their urban counterparts. Due to these declines in uninsurance rates, rural young adults also experienced significant declines in the proportion of mental health treatment services that were paid for without insurance, while urban young adults showed no effect. This also resulted in a significant DDD estimate, indicating rural residents experienced greater reductions in the proportion of mental health treatment services paid for without insurance than those of urban residents. Considering that the DCP showed no effect on Medicaid payments for treatment, together, these findings suggest that the DCP shifted payment for mental health treatment to private insurance, reducing out of pocket costs for mental health treatment among previously uninsured rural residents.

Furthermore, reductions in cost-related barriers to treatment following the DCP appeared to be completely concentrated among rural residents. For example, cost-related barriers for young people in need of mental health treatment declined by 16.77 percentage points following the DCP, however, while no significant effects occurred among urban dwelling young adults. This suggests that the overall declines in cost-related barriers to mental health treatment that were observed in our analyses using the full sample were primarily driven by rural residents. This finding is likely due to the fact that rural populations are more economically disadvantaged to begin with, therefore will

experience greater benefits from reductions in cost-related barriers to mental health treatment than urban dwellers.^{9,13,14}

Despite these gains, room for improvement still exists. While the magnitude of the DCPs effects were larger among rural populations compared to urban residents for outcomes of utilization of mental health treatment services, likelihood that mental health treatment was paid for by private insurance, and cost-related barriers to care, results from our DDD models provided no evidence that the DCP reduced rural-urban disparities for these measures.

Gaining private insurance could also allow individuals to shift their mental health care from safety-net providers to specialty settings that would not otherwise admit an uninsured patient. We observed significant increases in the proportion of urban young adults receiving mental health treatment from a private therapist. However, there were no changes in the type or setting that rural patients received mental health treatment, despite significant increases in insurance coverage. The DCP's apparent lack of the effect on the type of mental health treatment received in rural populations is likely due to the limited availability and accessibility of specialty mental health treatment options, including outpatient and inpatient facilities.⁹⁻¹¹ In fact, prior research suggests that most rural patients rely on primary care systems as their source of mental healthcare.¹³ This reflects a critical barrier to getting necessary mental health treatment for rural residents with significant mental illness, because the assessment and treatment of severe mental health disorders often exceeds the training, resources, and practical capabilities of primary care physicians.³⁹

Behavioral telehealth is a reasonable solution for providing improved access to mental health treatment in rural and remote areas. Behavioral telehealth refers to the delivery of psychiatric and other mental health care services using telecommunication technologies.⁴⁰ This use of technology enables rural residents to receive mental health treatment services remotely, regardless of the provider's physical location.^{40,41} The use of telehealth technology for service provision can also reduce the amount of travel time to treatment and associated costs for both providers and rural patients needing care. Furthermore, evidence suggests that service provision via behavioral telehealth is a sustainable and cost-effective solution that can be expanded and adapted to fit the unique needs of rural populations.⁴⁰⁻⁴³ However, the incorporation of telehealth into the current mental healthcare landscape will require changes in policies related to billing, reimbursement, patient confidentiality and security, provider restrictions, and requirements for training and supervision.⁴¹ Public health policy makers should continue to promote the advancement of behavioral telehealth technology practices in an effort to increase access to specialty mental health treatment services and reduce mental health disparities across rural America.

Limitations

This study has several limitations that should be considered. First, this study used a dichotomous variable to indicate rural or urban residence, meaning that we are unable to explore how study outcomes vary across the full urban-rural continuum. Next, due to the predefined age groups in the NSDUH, we could not exclude 26 year olds from our analysis. Because respondents are asked to answer questions based on their experiences

over the past 12 months, the inclusion of 26 year olds in our comparison group could lead to biased results. However, our main results were generally robust to sensitivity analyses using alternate age groups, with a few exceptions noted above. Similarly, state identifiers are not included in NSDUH public use files, therefore, we were unable to identify young adults residing in Medicaid expansion states from those living in non-expansion states in the year 2014.

While our study design allowed us to control for time-varying factors that might have affected access to and utilization of mental health treatment services across different age groups, we were unable to rule out the influence of additional simultaneously occurring events that might have impacted young adults. For example, the economic recession that spanned from late 2007 to 2009 likely had a profound impact on young adults. However, we addressed this limitation by including controls individual employment status in our regression models. Further, we could not determine whether or not some effects were connected to the early impact of federal Mental Health Parity and Addiction Equity Act (MHPAEA) in 2008.^{44,45} However, the MHPAEA did not require that plans cover behavioral health services—only that if behavioral health benefits existed, they were to be comparable with medical or surgical benefits.⁴⁴ Furthermore, the implementation of the MHPAEA was fragmented, and regulations were not finalized until November of 2013.^{44,45} Finally, as is the case with all surveys that measure stigmatized conditions such as mental illness, there is possible nonresponse and recall bias that may affect the validity of the self-reported use of mental health services in population surveys, especially among rural populations.

Conclusion

This study is the first to examine the differential impact of the DCP on access to and utilization of mental health treatment among rural versus urban residing young adults. We find that the DCP was associated with significant reductions in cost-related barriers to care, increases overall mental health treatment utilization, and increases the proportion of mental health treatment services paid for by private insurance for both urban and rural residing young adults. However, our DDD estimates indicated that the DCP had a greater impact on rural populations than urban in terms of the number of past year mental health treatment services paid for without insurance, which declined by nearly 18 percentage points more among rural young adults, compared to urban counterparts. Despite this, important disparities in access to specialty mental health providers in rural areas remains. Results from this study show the importance of health policy and reform in reducing barriers to the reception mental health treatment among rural young adults with mental illness. However, continued efforts are needed to promote the advancement of behavioral telehealth practices in an effort to increase access to specialty mental health treatment services to vulnerable individuals in rural and urban areas alike

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CHAPTER IV

EXAMINING THE IMPACT OF THE DEPENDENT COVERAGE PROVISION ON ACCESS TO AND UTILIZATION OF SUBSTANCE USE DISORDER TREATMENT SERVICES AMONG YOUNG ADULTS LIVING IN RURAL AND URBAN AREAS – A QUASI EXPERIMENT

Background

Drug and alcohol use disorders, also called substance use disorders (SUD), are among the most serious and costly public health issues in the United States. SUDs occur when recurrent alcohol or illicit drug use causes clinically significant impairment, including health problems, disability, and failure to meet essential responsibilities at school, work, or home.¹ Evidence suggests that the societal costs of substance use disorder are very high, with estimates exceeding 530 billion a year (in 2018 dollars).²⁻⁴ SUDs are also associated with significant morbidity and mortality^{5,6}, increased utilization of health services⁷, traffic fatalities⁸, and violent criminal activity.^{9,10}

Young adults have the highest prevalence of SUD compared to other age groups.¹¹ Despite this, less than 10% of young adults who meet the clinical criteria for a SUD receive SUD treatment services.¹² SUDs are often left untreated among young adults, in part due to lack of insurance coverage and inability to afford treatment costs.¹¹⁻¹³

Evidence suggests that rates of SUDs differ depending on rural or urban residence. Rural residing young people use alcohol at higher rates than their urban counterparts and are more likely to participate in risky alcohol-related behaviors,

including binge drinking and driving under the influence.¹⁴⁻¹⁶ Furthermore, rural populations suffer disproportionately from growing use and abuse of illicit substances, including opioids, heroin, prescription medications, and methamphetamines.¹⁷⁻¹⁹ Despite this, rural residents face additional barriers to accessing SUD treatment relative to their urban counterparts. Research indicates that rural areas frequently lack an adequate supply of substance abuse (drug and/or alcohol abuse) treatment facilities and specialty behavioral health providers.^{20,21} This means that rural residents travel longer distances to obtain SUD treatment compared to urban dwellers.^{22,23} Access to care is further complicated by the fact that rural residents also have higher rates of poverty, unemployment, and uninsurance, compared to their urban counterparts.²⁴⁻²⁶⁻²⁰

In an effort to reduce healthcare disparities, the Affordable Care Act's (ACA) Dependent Coverage Provision (DCP) sought to increase insurance coverage among young people by extending dependent coverage eligibility until age 26.²⁷ Increases in insurance coverage resulting from the DCP were expected to translate into increased utilization of substance use disorder treatment services, especially given the high prevalence of SUD in the young adult population. While the DCP expanded insurance coverage and increased healthcare utilization among young adults²⁸⁻³³, there is little evidence that the DCP improved access and utilization of SUD treatment services in young adults.³⁴⁻³⁷ Despite this, very few studies have examined whether the DCP had a differential effect on young adults living in rural versus urban areas.^{37,38} To date, only one study has attempted to examine the impact of the DCP on SUD treatment within rural residents.³⁷ However, this study simply described trends in SUD treatment use over

time, and could not make any empirical conclusions about the DCPs impact on SUD treatment among rural young people.³⁷ Thus, it remains unclear whether the DCP led to improvements for rural residents, who have historically lagged behind in access to behavioral health treatment.

To address this knowledge gap, this study examines the following research questions: 1.) To what extent did the DCP impact utilization of SUD treatment services among young adults residing in rural versus urban areas? 2.) To what extent did the DCP impact access to SUD treatment services among young adults residing in rural versus urban areas? The current study adds to current literature by using a quasi-experimental approach to estimate the DCP's effect on access to and utilization of SUD treatment services by comparing differences between the affected group of 19-25 year olds relative to a slightly older comparison group of 26-34 year olds unaffected by the policy, highlighting differences by urban or rural location. This could reveal whether national estimates masked effects experienced by rural or urban subgroups, or if the DCP impacted rural residents differently than urban. We also explore whether the DCP changed the type or setting of SUD care received by those needing treatment.

Methods

For the current study, we combined eight years of publically available data files from the 2007-2014 rounds of the National Survey of Drug Use and Health (NSDUH), an annual cross-sectional survey of the noninstitutionalized U.S. population aged 12 and over administered by the Substance Abuse and Mental Health Service Administration (SAMHSA).³⁹ Participants are selected using a stratified random sample of household

addresses across the United States. Using in-person and computer-assisted interviewing, the NSDUH collects information on substance use, abuse, and dependence; mental health problems; use of mental health and SUD treatment services.

Study Population

The study population included individuals between the ages of 19-34 who were likely to have a SUD. Because the DCP allowed young adults to stay on their parents' private health insurance until they reached age 26, our study population is separated into two cohorts to represent a treatment and comparison group. The treatment group is composed of young adults ages 19-25 years who were primarily impacted by the DCP, while the control group includes a cohort of slightly older individuals aged 26-34 years. The control group was selected because people ages 26–34 faced roughly similar social and economic conditions as those 19–25, but their eligibility for insurance coverage was unaffected by the DCP. Similar control and treatment groups have been used in prior published studies on impacts of the DCP.^{28,29,33-35}

Identification of Substance Use Disorder Cases

The NSDUH identifies people as possibly needing SUD treatment if they meet criteria for either dependence on or abuse of alcohol or illicit drugs (excluding tobacco). Screening criteria for substance abuse or dependence in the NSDUH are based on the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV).¹ According to the DSM-IV, an abuse diagnosis is recognized when at least one out of four abuse criteria are met. The four criteria for abuse include: 1.) failure to fulfill major role obligations at home, school, or work, 2.) continued substance use in

hazardous situations, 3.) recurrent legal problems related to substance use; and 4.) persistent use despite repeated social or interpersonal problems attributed to use.^{1,40} The DSM-IV identifies a dependence diagnosis when at least three out of seven dependence criteria are met. Dependence criteria include: 1.) tolerance to a substance, 2.) withdrawal symptoms, 3.) unplanned use, 4.) desire and/or inability to reduce or stop use, 5.) majority of time is spent obtaining, using, or recovering from effects of substance, 6.) continued use despite knowledge of recurrent medical or psychological problems, and 7.) neglect of important social or occupational activities because of substance use.^{40,41}

Since the publication of the DSM-IV, a substantial amount of research has revealed several issues relating to the validity and performance of DSM-IV diagnostic criteria for substance use disorders (SUDs).^{40,42,43} As a result, the most recent version of the DSM (DSM-V)⁴² combines abuse and dependence criteria into one disorder, used to indicate SUD.⁴³ For this reason, the NSDUH relies on DSM-IV screening criteria for both substance dependence and substance abuse to indicate SUD, which is consistent with the approach used to indicate SUD in the more recent DSM-V.⁴¹ However, assessment of changes in SUD criteria suggest that DSM-IV-based NSDUH estimates may underestimate DSM-V diagnosed SUD.^{40,42,43} Additional details on DSM-IV vs DSM-V assessments of SUD are included in figure C.1 in Appendix C.

Study Variables

The primary outcomes of interest are 1.) use of any SUD treatment in the previous twelve months and 2.) cost-related barriers to reception of SUD treatment in

past 12 months among individuals who reported a need for SUD treatment, but were unable to afford it. Any mental SUD treatment includes any inpatient or outpatient SUD treatment, including treatment received at a doctor's office, mental health clinic, inpatient or outpatient rehab, emergency department (ED) or Hospital. Barriers to the reception of SUD treatment occurred when a respondent indicated a need for care, but did not receive it because they were unable to afford treatment costs, their insurance does not cover treatment costs, or insurance does not cover all of treatment costs. Secondary outcomes include whether the DCP had an effect on the specific setting or type of treatment received (doctor's office, mental health clinic, inpatient or outpatient rehab, ED/Hospital) or the payment source for treatment services (private insurance, Medicaid, uninsured) among those who utilized any SUD treatment in the past year.

This study examines whether the impact of the DCP differs by area of residence. For the 2002-2014 NSDUHs, the respondent's area of residence was determined based on the 2003 Rural-Urban Continuum Codes, developed by the U.S. Department of Agriculture.⁴⁴ The NSDUH further categorizes county type into three groups based on Office of Management and Budget definitions for metropolitan and micropolitan statistical areas - 1) large metropolitan (population \geq 1 million), 2) small metropolitan (population < 1million), and 3) nonmetropolitan (locations outside of metropolitan statistical areas).⁴⁵ For our analyses, large and small metropolitan areas are considered as "urban" , and nonmetropolitan areas are considered "rural" areas.

We also include a number of demographic covariates, including sex, race/ethnicity (white, black, Hispanic, Native American, Asian/Hawaiian Pacific

Islander, other), marital status (married, divorced, widowed, never married), health status (excellent, very good, good, fair, poor), level of education (less than a high school diploma, high school graduate, some college, and college graduate), and employment status (part time, full time, unemployed, not in labor force/other).

Statistical Analyses

To identify the impact of the DCP on access to and utilization of SUD treatment, we begin with a difference-in-differences (DD) framework⁴⁶⁻⁴⁸, that compares changes in SUD outcomes among a target population of 19-25 year olds, relative to a slightly older comparison group of 26-34 year olds, before (2007-2010) and after (2011-2014) DCP implementation. We employ 3 separate DD models to explore the DCPs impact from a national perspective using the full study sample, and within rural and urban subgroups, using the following DD regression equation:

$$Y_{gt} = \alpha + \beta_1 Treatment_g + \beta_2 Post_t + \beta_3 (Treatment_g * Post_t) + \eta X_{gmt} + \vartheta Time_t + \varepsilon$$

In this equation, Y_{gt} represents the SUD outcome for individuals in the treatment/comparison group g for year t . *Treatment* is a binary variable equal to 1 if the individual is aged between 19-25 years, and equals 0 if the individual is aged 26-34 years. *Post* is a binary variable equal to 1 if the time period is after the DCP went into effect (2011-2014) and equal to 0 if the time period is before the DCP expansion (2007-2010). The X represents a vector of covariates: gender, marital status, education, employment, health status, and race. *Time* represents a vector of year-fixed effects. The coefficient β_3 is an estimate of the impact of the DCP expansion on SUD outcomes.

Next, we estimate the impact of the DCP on rural-urban disparities in SUD outcomes using a triple-difference (DDD) model, which is an extension of the standard DD model.^{48,49} As mentioned previously, the standard DD approach compares change in SUD outcomes over time in an intervention group with change over the same period of time in a comparison group unaffected by the DCP (regardless of urban/rural location). Because we are also interested in the differential effect of the DCP for a specific subgroup (rural young adults), we utilize a DDD approach. For each SUD outcome, we estimate the differential impact of the DCP between rural and urban populations using following DDD regression equation:

$$Y_{gct} = \alpha + \beta_1 Treatment_g + \beta_2 Post_t + \beta_3 (Treatment_g * Post_t) + \beta_4 (Treatment_g * Post_t * Rural_c) + \eta X_{gmt} + \vartheta Time_t + \varepsilon$$

In the DDD equation, Y_{gct} represents the SUD outcome for individuals in the treatment/comparison group g in rural category c for year t . *Treatment* is a binary variable equal to 1 if the individual is aged between 19-25 years, and equals 0 if the individual is aged 26-34 years. *Post* is a binary variable equal to 1 if the time period is after the DCP went into effect (2011-2014) and equal to 0 if the time period is before the DCP expansion (2007-2010). *Rural* is a binary variable equal to 1 if the individual lives in a nonmetropolitan county, and equal to 0 if the individual lives in a large or small metropolitan area. The X represents a vector of covariates: gender, marital status, education, employment, health status, and race. *Time* represents a vector of year-fixed effects. The coefficient β_4 is an estimate of the differential impact of the DCP on SUD outcomes for individuals living in rural areas.

While our outcomes are binary, we utilized linear probability models for our DD & DDD analyses because they typically produce reliable estimates of average effects that are easily interpreted as percentage point changes in study outcomes.⁴⁸ The linear approach also avoids difficulties related to the estimation and interpretation of multiple interaction terms and their standard errors in logit models.^{48,50} As a robustness check, we will compare results from the linear probability model to an alternate specification of DD & DDD models using logit regressions. Results from both models are compared and any discrepancies in results across specifications are reported. We used Stata 15⁵¹ for all statistical analyses and set the significance level at $p < 0.10$. We also use NSDUH survey weights and Stata survey commands to account for the complex survey design and to produce nationally representative estimates for the U.S. noninstitutionalized population.

Falsification Tests and Sensitivity Analyses

The validity of the DD approach relies on the assumption of parallel trends – or that in the absence of the DCP, outcomes in the 26-34 age group would have followed the same trend as those in the 19-25 age group. We assessed the parallel trends assumption by estimating regressions using only data prior to the enactment of the provision in 2010. To do this, we kept the same outcome and control variables, but the key independent variable was an interaction between a continuous time variable (i.e. year) and the dummy coded treatment variable.

While the DCP took effect on September 23, 2010, some private insurers began voluntarily covering young adults prior to this date.⁵² Therefore, we will also conduct sensitivity analyses in which we exclude 2010 surveys from our analyses. We will also

conduct additional sensitivity checks using alternative treatment and comparison groups by using more narrowed age groups, using adults ages 22-25 years as the treatment group and those aged 26-29 years as the comparison group. Finally, we conduct a series of falsification/placebo tests by estimating our regression model a placebo treatment group consisting of individuals between the ages of 26-29 years— an age group that was not affected by the DCP.

Results

Between 2007 and 2014, 24,133 individuals aged 19-25 and 6,216 individuals aged 26-35 who participated in the NSDUH were identified as having a SUD. Across the study period, the estimated proportion of the population with a SUD averaged 19.7% for 19-25 year olds (an estimated 5,758,711 individuals), and 13.3% for 26-34-year-olds (an estimated 4,865,027 individuals). Table 4-1 presents summary statistics of individuals with SUD in the treatment (19-25 year olds) and comparison (26-34 year olds) groups for the pre-DCP period (2007-2010) by area of residence. For nearly all demographic variables, urban populations differed significantly from rural populations across both age groups in the pre-DCP period. Rural areas had greater proportions of white residents and less racial diversity compared to urban areas. Rural residents also had lower proportions of college educated individuals compared to urban residents. There was minimal rural-urban variation across the remaining employment and health status variables.

Table 4-1. Sample Characteristics, National Survey on Drug Use and Health 2007-2014, Ages 19-25 and 26-34 with SUD, by Urban and Rural Location

	Age 19-25		Ages 26-34	
	Estimated mean/proportion (SE)		Estimated mean/proportion (SE)	
	Rural N=2,766	Urban N=10,520	Rural (N=604)	Urban ⁺ (N=2,460)
Sex				
Male	67.1 (1.1)	62.0 (0.6)***	70.2 (2.9)	68.8 (0.9)
Race				
White	80.3(1.1)	66.7 (0.7)***	75.3 (2.8)	63.4 (1.4)*
Black	7.2 (0.6)	10.7 (0.4)***	7.9 (1.8)	12.4 (1.0)
Asian	0.6 (0.3)	3.2 (0.2)***	0.3 (0.1)	2.3 (0.3)***
Hispanic	8.0 (0.9)	16.8 (0.5)***	12.8 (2.1)	19.7 (1.0)*
Other	3.9 (0.4)	2.6 (0.2)***	3.7 (0.9)	2.1 (0.3)*
Marital Status				
Married	7.6 (0.7)	5.8 (0.3)*	36.9 (3.0)	29.7 (1.2)*
Widowed	0.1 (0.04)	0.1 (0.03)	0.1 (0.1)	0.2 (0.1)
Divorced	3.3 (0.5)	1.8 (0.1)***	22.4 (2.9)	10.6 (0.9)***
Never Married	89.0 (0.8)	92.3 (0.3)***	40.6 (2.6)	59.5 (1.3)***
Education				
Less than high school diploma	20.2 (1.3)	13.4 (0.5)***	24.6 (2.2)	14.8 (0.9)***
High school grad	34.2 (1.1)	29.4 (0.7)**	41.1 (2.3)	24.3 (1.0)***
Some college	37.1 (0.9)	39.8 (0.7)	24.5 (1.8)	27.7 (1.1)
College grad	8.4 (1.3)	17.4 (0.6)***	9.7 (1.7)	33.1 (1.1)***
Employment				
Employed full time	44.5 (1.2)	46.1 (0.7)	65.4 (2.7)	71.2 (1.1)*
Employed part time	22.8 (1.4)	26.7 (0.6)**	9.2 (1.4)	10.9 (0.9)
Unemployed	15.2 (1.7)	11.6 (0.4)***	13.6 (2.1)	9.4 (0.6)*
Not in labor	17.4 (0.9)	15.6 (0.5)	11.8 (2.2)	8.4 (0.7)
Health				
Excellent	23.5 (1.2)	23.8 (0.5)	14.9 (1.9)	21.3 (1.1)**
Very good	39.6 (1.4)	41.8 (0.5)	42.1 (2.6)	39.0 (1.3)
Good	28.8 (1.1)	27.1 (0.6)	28.4 (2.8)	30.4 (1.4)
Fair/Poor	8.1 (0.6)	7.2 (0.3)	14.6 (2.2)	9.2 (0.8)*
SUD treatment				
Any SUD treatment ^a	10.2 (0.8)	8.2 (0.4)*	14.2 (2.1)	9.1 (0.8)*
Doctors office	13.7 (2.8)	19.9 (1.9)	20.8 (6.2)	20.9 (3.6)
Mental Health clinic	23.3 (2.9)	25.0 (1.8)	37.2 (5.0)	25.4 (3.2)*
Rehab Facility	58.2 (4.1)	51.8 (1.7)	74.5 (5.8)	51.2 (4.8)**
ED or Hospital	16.3 (2.9)	23.2 (1.9)	34.9 (5.4)	22.6 (3.5)
Insurance Status				
Private	49.3 (1.5)	56.5 (0.7)***	46.2 (3.0)	57.0 (1.5)**
Medicaid	9.4 (0.8)	8.4 (0.3)	16.0 (2.2)	9.9 (0.7)**
Uninsured	37.2 (1.5)	30.6 (0.5)	33.4 (3.1)	29.5
Payment for past treatment episode				
Paid by Private insurance	23.1 (3.1)	28.6 (2.1)	42.5 (7.3)	20.2 (4.1) ***
Paid by Medicaid	12.0 (2.5)	16.0 (1.9)	35.2 (7.9)	14.5 (3.5)*
Paid without insurance ^e	64.4 (4.0)	69.1 (2.1)	61.5 (6.1)	66.7 (3.7)
Cost-related barriers to care	59.6 (5.6)	38.9 (3.6) *	36.4 (11.1)	48.5 (5.6)

^aRates were compared with rural populations of the same age group and time period

* p<0.05, ** p<0.01, *** p<0.001

^e Self- or family insured, or uncompensated care

Utilization of SUD treatment was significantly higher among rural residents relative to urban residents for both the 19-25 (10.2% vs 8.2%, $p=0.0171$) and 26-34 (14.2% vs 9.9%, $p=0.036$) age groups prior to the DCP. Regardless of age or area of residence, most individuals who received SUD treatment paid for treatment costs without insurance. Rural residents also had lower rates of private insurance coverage compared to urban dwellers (19-25 group = 49.3% vs 56.5%, $p=0.001$; 26-34 group = 46.2% vs 57.0%, $p=0.036$). Notably, rural 19-25 year olds had higher percentages of individuals reporting cost-related barriers to mental health treatment compared to urban dwellers in the same age group (59.6% vs 38.9%, $p=0.0039$).

Utilization of Substance Use Disorder Treatment

Table 4-2 presents DD & DDD estimates of the DCPs impact on utilization of SUD treatment services. Columns 2-4 of table 4-2 present estimates of the DCPs effect on use of any SUD treatment among young adults aged 19-25, relative to residents aged 26-34 using the full study sample (both urban and rural residents). Our results suggest that the DCP had no significant effect on utilization of any type of SUD treatment services among 19–25 year olds relative to 26–34 year olds (table 4-2 column 4). Furthermore, there were no significant changes in type or setting of SUD treatment among young adults in the full sample.

Columns 5-7 of table 4-2 present estimates of the DCPs effect on use of any SUD treatment among rural young adults aged 19-25, relative to rural residents aged 26-34. Here we find no significant changes in the use SUD treatment of any type among rural young adults following the DCP (table 4-2 column 7). However, the DCP did change the

setting and type of SUD treatment received among those needing care. In particular, the DCP resulted in a statistically significant increase in SUD treatment received at ED/Hospitals ($DD_r=38.16$, $p<0.0001$), rehab facilities ($DD_r=28.94$, $p=0.004$), and mental health clinics ($DD_r=18.52$, $p=0.044$).

Columns 8-10 of table 4-2 present estimates of the DCPs effects on utilization of any SUD treatment among urban young adults aged 19-25 relative to urban young adults aged 26-34 years. As seen in column 10, there were no significant changes in the use SUD treatment of any type among urban young adults following the DCP. Similarly, the DCP did not have an impact on the type or setting at which urban young adults received SUD treatment services in the past year.

Column 11 of table 4-2 presents triple difference estimates of the DCP's effects on SUD treatment outcomes, indicating the differential impact between urban and rural populations. DDD estimates were positive and significant for the reception of treatment at an ED/hospital ($DDD=46.43$, $p>0.001$), rehab facility ($DDD=35.96$, $p=0.006$), and/or mental health clinic ($DDD=20.02$, $p=0.065$). This means that reception of SUD treatment at these settings increased more among rural young adults compared to their urban counterparts.

Table 4-2. Impact of DCP on Utilization of SUD Treatment Services among 19-25 year olds, compared to 26-34 year olds, estimated from the National Survey on Drug Use & Health 2007-2014

Column #1	Full Sample			Rural			Urban			Triple difference
	2 Pre _f	3 Post _f	4 DD _f (Pre _{ft} - Post _{ft}) - (Pre _{fc} - Post _{fc})	5 Pre _r	6 Post _r	7 DD _r (Pre _{rt} - Post _{rt}) - (Pre _{rc} - Post _{rc})	8 Pre _u	9 Post _u	10 DD _u (Pre _{ut} - Post _{ut}) - (Pre _{uc} - Post _{uc})	11 DDD (DD _r - DD _u)
Any SUD treatment^a										
19-25	8.5%	8.7%	-0.05% (p=0.967)	10.2%	9.5%	2.30% (p=0.455)	8.2%	8.6%	-0.43 (p=0.730)	2.91 % (p=0.401)
26-34	9.7%	10.4%		14.2%	10.7%		9.1%	10.4%		
Type/Setting of past year Treatment^b										
Doctors office										
19-25	18.7%	21.1%	2.60% (p=0.592)	13.4%	17.4%	10.89% (p=0.197)	19.9%	21.8%	0.86% (p=0.873)	12.29% (p=0.212)
26-34	20.9%	20.9%		20.8%	14.6%		20.9%	21.7%		
Mental Health clinic										
19-25	24.7%	27.8%	-0.28% (p=0.956)	23.3%	32.0%	18.52% (p=0.044)	25.0%	27.1%	-3.59% (p=0.549)	20.02% (p=0.065)
26-34	27.6%	32.7%		37.2%	32.7%		25.4%	32.5%		
Rehab facility ^o										
19-25	52.9%	57.9%	1.60% (p=0.780)	58.2%	63.7%	28.94% (p=0.004)	51.8%	56.9%	-3.07% (p=0.620)	35.96% (p=0.006)
26-34	55.7%	60.4%		74.5%	48.2%		51.2%	62.0%		
ED or Hospital										
19-25	22.0%	29.9%	2.60% (p=0.634)	16.3%	30.1%	38.16% (p=0.000)	23.2%	29.9%	-3.96% (p=0.323)	46.43% (p=0.000)
26-34	25.0%	32.1%		34.9%	10.3%		22.6%	35.0%		

^f Estimates derived from full sample (urban + rural, n= 30,349)

^r Estimates limited to rural residents (n= 6,120)

^u Estimates limited to urban residents (n= 24,229)

^a Includes treatment for alcohol and illicit drugs

^b Among those who received any SUD treatment in the past 12 months (N_r=2,915, N_f= 706, N_u= 2,209)

^o Includes inpatient and outpatient rehabilitation

^f Treatment group (19-25 yrs)

^c Control group (26-34 yrs)

Insurance Status

Table 4-3 presents estimates of the DCP's effect on insurance status among young adults aged 19-25 years, compared to individuals aged 26-34 years. Columns 2-4 of Table 4-3 includes estimates for the full study population. As seen in column 4, the DCP resulted in a significant increase in private insurance coverage among young adults, relative to the comparison group (DD_f=8.65, p>0.001). The DCP was also associated with a significant 9.74 percentage point decline in the proportion of young adults

without insurance coverage ($DD_r=9.74$, $p>0.001$). As expected, the DCP had no effect on the proportion of young adults who were insured through Medicaid.

Columns 5-7 of table 4-3 provide estimates of the DCPs impact on insurance status among rural young adults, relative to the comparison group. Here, we find that private insurance coverage significantly increased by 9.02 percentage points among young adults aged 19-25 years following the DCP ($p=0.030$). The DCP also resulted in significant declines in the proportion of rural 19-25 year olds without insurance coverage ($DD_r=-12.67$, $p=0.003$). There were no changes in Medicaid coverage among young adults following the DCP.

Estimates of the DCPs impact on insurance status among urban 19-25 year olds versus urban 26-35 year olds are included in columns 8-10 of table 4-3. Following the DCP, urban young adults also experienced a significant 8.08 percentage point increase in private insurance coverage ($DD_u=8.08$, $p>0.001$) and significant 9.24 percentage point decrease the number of urban young adults without insurance coverage ($DD_u=-9.24$, $p>0.001$). However, no changes in Medicaid coverage occurred among urban young adults as a result of the DCP.

The triple difference estimates for insurance status listed in column 11 of table 4-3 were not significant, indicating that the DCP did not significantly impact rural-urban disparities private insurance coverage or the proportion of young adults without insurance.

Table 4-3. Impact of DCP on insurance status among 19-25 year olds vs 26-34 year olds with SUD, estimated from the National Survey on Drug Use & Health 2007-2014

Column #1	Full Sample			Rural			Urban			Triple difference
	2 Pre _f	3 Post _f	4 DD _f (Pre _f - Post _f) - (Pre _c - Post _c)	5 Pre _r	6 Post _r	7 DD _r (Pre _r - Post _r) - (Pre _c - Post _c)	8 Pre _u	9 Post _u	10 DD _u (Pre _u - Post _u) - (Pre _c - Post _c)	11 DDD (DD _r - DD _u)
Private										
19-25	55.4%	59.6%	8.65% (p=0.000)	49.3%	53.3%	9.02% (p=0.030)	56.5%	60.6%	8.08% (p=0.000)	0.93% (p=0.839)
26-34	55.6%	50.9%		46.2%	45.2%		57.0%	51.6%		
Medicaid										
19-25	8.5%	10.8%	0.91% (p=0.407)	9.4%	12.9%	2.22% (p=0.416)	8.4%	10.5%	0.63% (p=0.623)	1.77% (p=0.592)
26-34	10.7%	12.7%		16.0%	15.9%		9.9%	12.3%		
Uninsured										
19-25	31.5%	24.0%	-9.74% (p=0.000)	37.2%	28.5%	-12.67% (p=0.003)	30.6%	23.3%	-9.24% (p=0.000)	-3.41% (p=0.458)
26-34	30.0%	32.3%		33.4%	34.5%		29.5%	32.0%		

^f Estimates derived from full sample (urban + rural, n= 30,349)

^r Estimates limited to rural residents (n= 6,120)

^u Estimates limited to urban residents (n= 24,229)

^f Treatment group (19-25 yrs)

^c Control group (26-34 yrs)

Payer Source for SUD Treatment

Table 4-4 presents estimates of the DCP's effect on payment source for SUD treatment among 19-25 year olds who received SUD treatment services in the past year, relative to the comparison group. Columns 2-4 of Table 4-4 includes estimates for the full study population. There were no significant changes in the percentage of SUD treatment services that were paid for by private insurance among 19-25 year olds, relative to the comparison group. Additionally, the DCP did not significantly impact the proportion of SUD treatment services that were paid for without insurance. As expected, the DCP had no impact on the likelihood that past year SUD treatment was paid for by Medicaid among 19-25 year olds, relative to those aged 26-34 years.

Columns 5-7 of table 4-4 presents estimates of the DCP's effect on payment source for SUD treatment among rural residents. Here we find that the DCP was associated with a significant increase in the proportion of SUD treatment services that were paid for by private insurance among rural residents aged 19-25 years, compared to 26-34 year olds ($DD_r=19.54$, $p=0.097$). However, DCP had no effect on the proportion of SUD treatment services that were paid for without insurance among rural young adults. There were also significant changes in the percentage of SUD treatment services that were paid for by Medicaid among rural 19-25 year olds, relative to residents aged 26-34 ($DD_r=22.17\%$, $p=0.026$).

Columns 8-10 of table 4-4 presents estimates of the DCP's effect on payment source for SUD treatment among urban dwellers aged 19-25 compared to those aged 26-34 year. Findings suggest that there were no significant changes in the proportion of SUD treatment services that were paid for by private insurance among urban 19-25 year olds, relative to the comparison group. Additionally, the DCP had no effect on the percentage of SUD treatment services that were paid for without insurance among urban young adults. Moreover, the DCP had no impact on the likelihood that past year SUD treatment was paid for by Medicaid among 19-25 year olds, relative to those aged 26-34 years.

Results from our triple difference analyses are presented in column 11 of table 4-4. We observed a significant 25.83 percentage point ($p=0.031$) difference between rural and urban individuals reporting that their past year mental health treatment was paid for by private insurance. This suggests that the proportion of SUD treatment services that

were covered by private insurance increased by 25.83 points more for rural residents than urban dwellers following the DCP. Triple difference estimates were not significant for the probability that past year treatment was paid for by Medicaid and/or paid for without insurance.

Table 4-4. Impact of DCP on Payer Source for Past Treatment Episode among 19-25 year olds, compared to 26-34 year olds, estimated from the National Survey on Drug Use & Health 2007-2014

	Full Sample			Rural			Urban			Triple difference
Column #1	2	3	4	5	6	7	8	9	10	11
	Pre _f	Post _f	DD _f (Pre _{fi} - Post _{fi}) - (Pre _{fc} - Post _{fc})	Pre _r	Post _r	DD _r (Pre _{ri} - Post _{ri}) - (Pre _{rc} - Post _{rc})	Pre _u	Post _u	DD _u (Pre _{ui} - Post _{ui}) - (Pre _{uc} - Post _{uc})	DDD (DD _r - DD _u)
Paid by private Insurance										
19-25	27.6%	38.1%	4.25% (p=0.457)	23.1%	38.3%	19.54% (p=0.097)	28.6%	38.0%	-0.04% (p=0.994)	25.83% (0.031)
26-34	24.4%	31.5%		42.5%	34.3%		20.2%	31.2%		
Paid by Medicaid										
19-25	15.3%	14.4%	1.41% (p=0.733)	12.0%	20.3%	22.17% (p=0.026)	16.0%	13.4%	-3.19% (p=0.468)	23.83% (p=0.027)
26-34	18.5%	18.6%		35.2%	25.8%		14.5%	17.6%		
Paid without insurance ^e										
19-25	68.3%	64.6%	-1.89% (p=0.728)	64.4%	66.9%	-7.30% (p=0.484)	69.1%	64.2%	-1.47% (p=0.807)	2.86% (p=0.812)
26-34	65.7%	61.2%		61.5%	6.9%		66.7%	60.5%		

_f Estimates derived from full sample (urban + rural, n= 30,349)

_r Estimates limited to rural residents (n= 6,120)

_u Estimates limited to urban residents (n= 24,229)

^e Self- or family insured, or uncompensated care

_i Treatment group (19-25 yrs)

_c Control group (26-34 yrs)

Cost-related Barriers to SUD Treatment

Table 4-5 provides estimates of the DCP's effect on cost-related barriers to SUD treatment among young adults who reported a need for SUD treatment but did not receive it. Columns 2-4 of of Table 4-5 provides estimates for the full study population, which suggest that the DCP resulted in a significant 18.02 percentage point (p=0.012) decrease in cost-related barriers to SUD treatment among 19-25 year olds, compared to

those aged 26-34. Similar results were found in the rural subgroup (columns 5-7 of table 4), where the DCP was associated with a significant 35.35 percentage point ($p=0.021$) decline in cost-related barriers to SUD treatment. Compared to 26-34 year olds, urban dwellers aged 19-25 years also experienced significant declines in cost-related barriers to the reception of SUD treatment ($DD_u=-13.96$, $p=0.086$). Triple difference estimates for cost-related barriers to SUD treatment were not significant (column 11 of table 4-5), indicating that the DCP did not significantly impact rural-urban disparities in cost-related barriers to treatment in young adults.

Table 4-5. Impact of DCP on Cost Related Barriers to SUD Treatment among 19-25 year olds, compared to 26-34 year olds, estimated from the National Survey on Drug Use & Health 2007-2014**

Column #1	Full Sample			Rural			Urban			Triple difference
	2 Pre _f	3 Post _f	4 DD _f (Pre _{fi} - Post _{fi}) - (Pre _{fc} - Post _{fc})	5 Pre _r	6 Post _r	7 DD _r (Pre _{ri} - Post _{ri}) - (Pre _{rc} - Post _{rc})	8 Pre _u	9 Post _u	10 DD _u (Pre _{ui} - Post _{ui}) - (Pre _{uc} - Post _{uc})	11 DDD (DD _r - DD _u)
19-25	42.9%	31.2%	-18.02% ($p=0.012$)	59.6%	34.3%	-35.35% ($p=0.021$)	38.9%	30.7%	-13.96% ($p=0.086$)	-21.98% ($p=0.244$)
26-34	46.8%	53.0%		36.4%	43.7%		48.5%	54.5%		

** Among those with SUD who reported a need for treatment but did not receive it

_f Estimates derived from full sample (urban + rural, $n= 30,349$)

_r Estimates limited to rural residents ($n= 6,120$)

_u Estimates limited to urban residents ($n= 24,229$)

_i Treatment group (19-25 yrs)

_c Control group (26-34 yrs)

Falsification and Sensitivity Analyses

We employed a series of falsification and sensitivity analyses to check the robustness of our results. To assess the appropriateness of the DID approach, the assumption of parallel trends was tested between the treatment and comparison group for

the outcomes prior to DCP implementation (Appendix D Table D.1). We observed no significant differences in pre- trends between groups for all outcomes with one exception. When models were limited to the rural subpopulation, the parallel trends test was violated for reception of past year SUD treatment rehab facility. However, while important to recognize, this difference should not undermine overall findings, as it is the only instance of the parallel trends assumption being violated out of the three DD models included in the study.

In our second falsification test, we estimate models using a “placebo” treatment group consisting of adults ages 26-29 years, an age group that should not have been impacted by the DCP, relative to adults aged 30-34 years. As shown in appendix D table D.2, placebo effects were nonsignificant for nearly all study outcomes.

To further assess the validity of our model, we conducted two additional sensitivity tests. First we explore the sensitivity of our results by omitting 2010 surveys from our analysis (Appendix D, table D.3). Findings were similar to the results found in our main analyses, with a two small exceptions: the DDD coefficient for private insurance payment for past year SUD treatment became statistically insignificant ($DDD=22.97$, $p=0.106$) and the DDD coefficient for cost-related barriers to care became statistically significant at the $p<0.10$ level ($DDD=-37.31$, $p=0.077$).

Next we explored whether results are sensitive to our choice of treatment and comparison groups by estimating models using individuals aged 22-25 as our treatment groups, and those aged 26-29 as our comparison group (Appendix D, table D.4). The use of alternative age groups revealed the several differences. First, reception of SUD

treatment at a doctor's office became significant in rural young adults ($DD_r=23.22$, $p=0.060$). Additionally, increases in reception of SUD treatment at a mental health clinic within the rural subpopulation became nonsignificant ($DD_r=16.76$, $p=0.214$), and as a result, the triple difference estimate for this measure also emerged as nonsignificant ($DDD=21.69$, $p=0.240$). Furthermore, reductions in cost-related barriers to SUD treatment no longer reached statistical significance for urban ($DD_u=-29.39$, $p=0.169$) and rural ($DD_r=-18.70$, $p=0.177$) models. While the literature suggests that the use of a narrowed age bandwidth yields more reliable and robust estimates of the DCP's effect⁴⁷, our insignificant findings could be due the substantial reduction in sample size that occurred as a result of using these narrowed age groups ($N=30,349$ using ages 19-34; $N=16,654$ using ages 22-29). As a result, models using alternative age groups were likely unpowered to detect significant differences, especially when models were stratified by rural residence. To be clear, we use individuals aged 26-34 years as our comparison group, because they are close enough in age to have experienced similar social and economic conditions as those aged 19–25, and also have a large enough sample size for statistical power, especially since sample sizes in the NSDUH decrease with age.

Discussion

Given the negative impacts SUD in the US, it is imperative that SUD treatment services not only be affordable and effective, but also accessible to patients, especially those in rural areas. The DCP was one of the tools by which the ACA attempted to alleviate barriers to the reception of timely SUD treatment in a population with a high prevalence of SUD. Several prior studies have documented increased use of health

services as a result of the DCP, however evidence of the DCP's impact on SUD treatment remains unclear.³⁴⁻³⁶ We extend the literature by comparing changes in access to and utilization of SUD treatment before and after DCP implementation among individuals aged 19-25 compared to those aged 26-34 in rural versus urban areas.

Several key findings emerged from our study. Following the DCP, both rural and urban young adults experienced significant increases in private insurance coverage and significant reductions in uninsurance and cost-related barriers to SUD treatment. Despite this, findings indicate that the DCP did not significantly effect SUD treatment utilization among rural and urban residents, alike. These findings mirror those of the previous studies on ACA's effect on SUD treatment use.³⁴⁻³⁷

There are several reasons why increases in insurance coverage and reductions in cost-related barriers to care may not necessarily translate into increased utilization of SUD treatment for young adults. First, at the time of DCP implementation in 2010, existing parity laws did not require coverage for SUD treatment, they only ensured that private coverage for behavioral healthcare (IF provided) be equivalent to medical/surgical benefits.^{54,55} So, even though insurance coverage increased among young adults after the DCP, coverage for high quality SUD treatment was not guaranteed. Furthermore, some of the treatments for mental health and substance use disorders do not have an equivalent medical/surgical treatment, making comparison nearly impossible and true parity difficult to achieve. While this issue was somewhat addressed in later provisions of the ACA that required insurance coverage of SUD treatment as an essential health benefit, these additional provisions did not become

effective until 2014. Even so, there is little evidence that SUD treatment utilization increased as a result of the coverage requirement or the 2014 Medicaid expansions.⁵⁶ Lags in SUD treatment utilization in young adults following the DCP could be a result of the providers' inability to accept private insurance payment, often because they lack the necessary technology to bill insurance companies or maintain electronic health record systems.^{57,58} Alternatively, findings could also reflect a lack of perceived need for SUD treatment among young adults with a SUD, but could also indicate the persistence of non-financial barriers to SUD treatment, such as stigma and long wait times for care.⁵⁹

As expected, when we stratified our models by area of residence, we find that the DCP effected rural and urban individuals differently. Interestingly, while both rural and urban young adults experienced gains in private insurance coverage as a result of the DCP, only rural residents experienced significant increases in private insurance payment for their past year SUD treatment services. As a result, the proportion of SUD treatment services that were covered by private insurance increased by 25.83 points more for rural residents than urban dwellers following the DCP ($p=0.031$). This provides evidence that the DCP was especially beneficial for rural residents, indicating rural young adults were able to use their newly acquired insurance to cover treatment costs. Furthermore, while both rural and urban residents experienced decreases in cost-related barriers to treatment, the magnitude of reductions in cost-related barriers among rural young adults were more than double those experienced by urban dwellers ($DD_r = -35.35$, $p=0.021$ vs $DD_u = -13.96$, $p=0.086$). Despite this, we found no evidence that the DCP significantly reduced urban-rural disparities in cost-related barriers ($DDD = -21.98$, $p=0.244$).

Findings also showed that the DCP impacted the treatment setting at which rural residents obtain SUD care, yet no such changes occurred in urban residents. Specifically, reception of SUD treatment at a mental health clinic, rehabilitation facility, and ED or Hospital increased for rural young adults as a result of the DCP. Increased reception of care at a mental health clinic and/or rehab facility are encouraging, suggesting that the DCP increased access to specialty behavioral health care among rural residents. Indeed, results from our triple differences analysis provided evidence that the DCP reduced urban-rural disparities in access to specialized SUD treatment at a mental health clinic or rehab facility, as evidenced by the lack of effect in urban areas and a significant increase in rural areas. However, these findings are undermined by subsequent increases in the proportion of rural young adults receiving care at safety-net facilities such as EDs or hospitals. Increased reception of SUD care at safety-net facilities are likely a consequence of chronic shortages of behavioral health providers and insufficient access to alternative treatment options, as EDs and hospitals frequently stand in as the primary source of local healthcare in rural communities.^{60, 61} Despite this, rural hospitals are especially vulnerable to closure due to low patient volumes and financial challenges, and the rate of rural hospital closures has increased significantly over the past decade.^{62,63} To ensure the longevity of rural safety-net providers, there is a need for initiatives that allow remaining rural hospitals the flexibility to reconfigure their structures to provide a broader or more appropriate mix of services that include SUD prevention, treatment, and recovery services.

Rural hospitals across the country have turned to telehealth to increase access to health services, including behavioral health and addiction treatment services.⁶³⁻⁶⁵ Delivery of SUD treatment via telehealth involves the use of telecommunication technologies to provide long-distance clinical healthcare, and has been shown to be an effective approach for increasing access to SUD treatment in rural areas.⁶⁵⁻⁶⁸ While the use of telehealth has been shown to increase access and reduce barriers to behavioral health care in rural area, several challenges related to billing and reimbursement have prevented the widespread adoption of telehealth for SUD treatment.^{65,68,69,57,58} While several states have enacted parity legislation requiring private insurers to provide coverage for telehealth services, the level of reimbursement can vary considerably by state and may not equivalent to in-person service.^{65,68,69} Some states also have varying restrictions related to the geographic area or location at which telehealth services can be received.^{68,69} This patchwork of conflicting and confusing state policies reveals a need for development of national guidelines for telehealth reimbursement and practice standards.

Limitations

Several limitations should be considered when interpreting the study results. We used a dichotomous variable to define rural status, limiting our ability explore how study outcomes vary across the full urban-rural continuum. Additionally, rural residents accounted for about 20 percent of full study sample, meaning rural models may have been underpowered due to limited sample size. Next, state identifiers are not included in NSDUH public use files, meaning we were unable to control for unmeasured differences

across states using state fixed-effects. Next, because respondents are asked to answer questions based on their experiences over the past 12 months, the inclusion of 26 year olds in our comparison group could lead to biased results. However, due to the predefined age categories in the NSDUH, we were unable to exclude 26 year olds from our analysis. However, our main results were generally robust to sensitivity analyses using alternate age groups, with a few exceptions, as noted above.

The benefit of the DD approach is that it adjusts for time-varying factors that might have affected study outcomes.⁴⁶⁻⁴⁹ However, we were unable to rule out the influence of other simultaneously occurring events or underlying factors that could have influenced study outcomes. Further, we could not determine whether or not some effects of the DCP were connected to the early impact of federal Mental Health Parity and Addiction Equity Act (MHPAEA) in 2008.^{57,58} However, the MHPAEA did not require that plans cover behavioral health services, it only ensured that if behavioral health benefits are included, this coverage must be comparable to coverage of other medical conditions.⁵⁸ Finally, as is the case with all surveys that measure stigmatized conditions such as mental illness and SUD, it is possible that nonresponse and recall bias compromised the validity of survey results.

Conclusion

Findings from this study indicate that increases in insurance coverage alone is not enough to facilitate increased treatment utilization, as access to care remains a crucial component. Public health policy-makers should support initiatives that allow rural local safety-net providers the flexibility to tailor their services to meet the physical and

behavioral health needs of the community. Without renewed efforts to alleviate barriers to the reception of adequate SUD treatment in rural areas, disparities in behavioral health treatment will likely persist. Telehealth holds promise for alleviating access barriers to reception of behavioral health care for young adults in urban and rural areas. However, renewed efforts are needed to develop consistent and straightforward guidelines on telehealth reimbursement and other practice standards to ensure widespread adoption and sustainability of services in rural and urban areas alike.

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CHAPTER V

CONCLUSIONS

Health insurance coverage rates for young adults have historically been the lowest of any age group, and lack of health insurance is one of the most significant barriers to health care among this population.¹ Thus, an important goal of the Affordable Care Act's Dependent Coverage Provision was to increase health insurance coverage among this age group by enabling young adults to remain on their family's private insurance plan as dependents until age 26.² Expansions in young adult insurance coverage were expected to reduce barriers to care and increase utilization of needed health services. This dissertation includes a comprehensive evaluation of the dependent coverage provision's impact on young adult's access to and use of health care services in young adults, providing insights into whether the policy's impact differed by urban-rural residence.

Study one provided a comprehensive summary of existing literature on the DCP's impact on access to and utilization of health care. Findings highlight the positive effects of the DCP on several access to care measures. In particular, evidence suggests that the DCP increased young adult's private insurance coverage, access to a usual source of care, and reduced medical expenditures and out of pocket health care costs. Improvements in access to care translated into increased utilization of some types of health services, but not others. For example, the DCP was associated with increased utilization of dental services, mental health treatment, prenatal care, and preventative health screenings, but had no effect on utilization of substance use disorder treatment or routine check-ups. Furthermore, evidence of the DCP's impact on emergency

department visits and inpatient stays were mixed, highlighting an opportunity for continued research and evaluation. Importantly, very few studies have examined whether the DCP impacted disparities in access to and utilization of health care.

Findings that the DCP impacted utilization of some types healthcare, but not others, is particularly evident in terms of behavioral health care utilization. Consistent with prior literature, findings from studies two and three suggest that that utilization of mental health treatment increased as a result of the DCP, while SUD treatment rates remained unchanged. Studies two and three also provide evidence that the DCP's effect varied by urban or rural residence, with rural residents showing greater benefits than urban in regards to increased insurance coverage, reductions in cost-related barriers to care, and the proportion of behavioral health treatment costs paid for out of pocket (or without insurance). The impact of the DCP on behavioral health treatment settings also appeared to differ depending on rural or urban residence and whether the treatment was for mental health or SUD. For example, the DCP increased reception of mental health treatment from a specialty provider among urban residents, but not rural, while the opposite is true for SUD treatment, where reception of specialty treatment increased in rural residents, but not urban. The apparent shifts in treatment settings for SUD care could be especially beneficial for rural young adults suffering from addiction, indicating that individuals are being placed in more appropriate, cost-effective care. However, the lack of effect on mental health treatment settings for rural young adults also may suggest that significant barriers to appropriate and timely mental health treatment options remains.

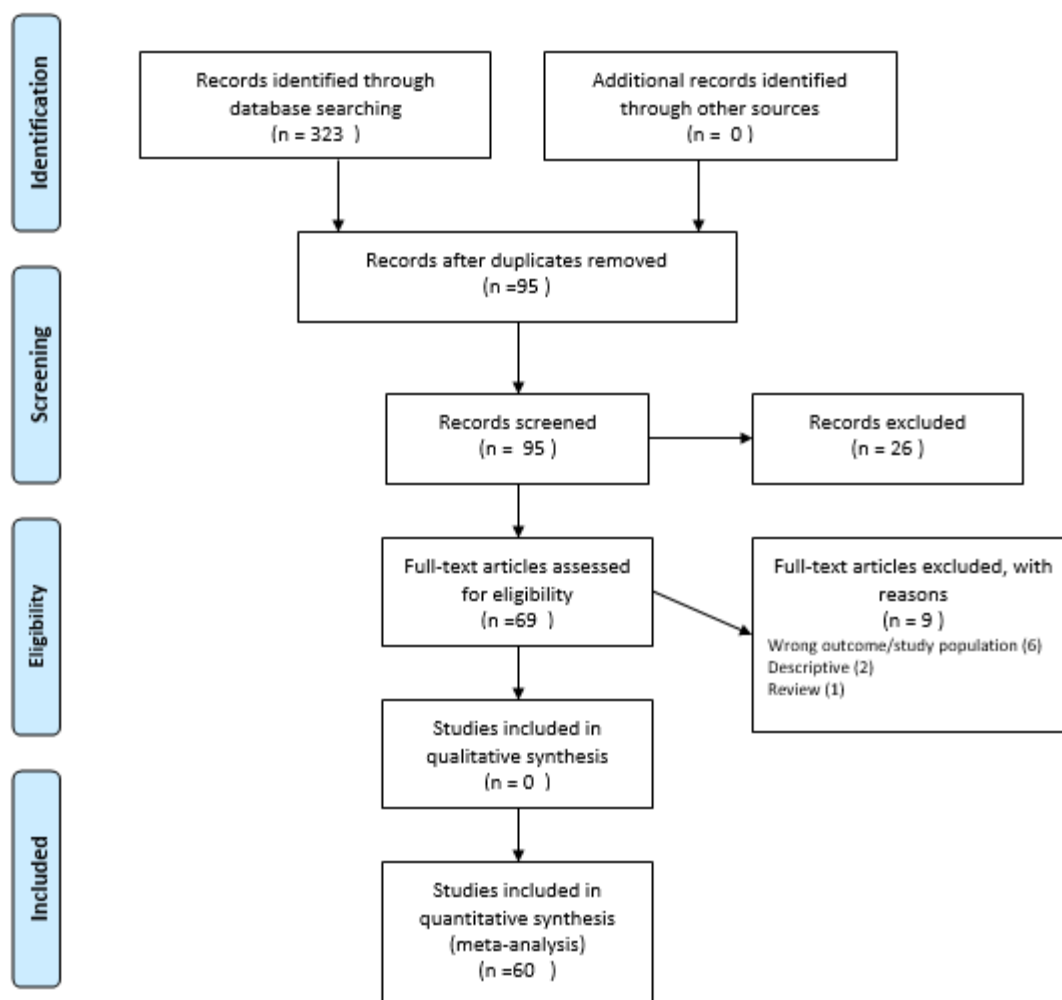
Together, study results suggest that health policy can effect populations differently depending on area of residence and available resources. Accordingly, health reform should not be a one size fits all approach. This research highlights the importance of comprehensive health reform efforts that can be strategically adapted and tailored to the unique needs of the community. Study results illustrate that efforts to expand insurance coverage must be met with modifications to service delivery and provider reimbursement processes to ensure that treatment is both affordable and accessible to the most vulnerable patients. Without careful consideration of the potential differential impact of health policy on desperate populations, health disparities are bound to persist.

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APPENDIX A

Figure A.1 PRISMA Flow Diagram



APPENDIX B

Table B.1 Trends in Outcomes in Pre DCP period (2007-2010)

	Full sample DD _f	Rural DD _r	Urban DD _u	DDD DD _r – DD _u
Any MH treatment	-1.73 (p=0.089)	-1.36 (p=0.600)	-1.80 (p=0.092)	-0.40 (p=0.878)
Type of Past Year Treatment				
Inpatient	-0.58 (p=0.548)	-3.14 (p=0.196)	0.02 (p=0.985)	-3.70 (p=0.145)
Prescription	-0.29 (p=0.836)	5.70 (p=0.037)	-1.46 (p=0.374)	6.95 (p=0.031)
Outpatient	1.00 (p=0.519)	-3.55 (p=0.300)	2.12 (p=0.198)	-5.98 (p=0.114)
Private doctor	-0.34 (p=0.770)	0.23 (p=0.938)	-0.44 (p=0.730)	0.63 (p=0.848)
Private therapist	0.86 (p=0.591)	6.18 (p=0.023)	-0.04 (p=0.984)	6.24 (p=0.063)
MH Clinic	-0.31 (p=0.781)	-6.30 (p=0.045)	0.84 (p=0.482)	-7.44 (p=0.029)
Medical Clinic	1.71 (p=0.080)	1.01 (p=0.619)	2.00 (p=0.053)	-1.33 (p=0.548)
Insurance Status				
Private insurance	1.46 (p=0.179)	2.24 (p=0.290)	1.24 (p=0.264)	1.09 (p=0.621)
Medicaid	0.22 (p=0.762)	-1.22 (p=0.522)	0.56 (p=0.451)	-2.18 (p=0.271)
Uninsured	-0.50 (p=0.614)	-1.19 (p=0.586)	0.39 (p=0.730)	-0.42 (p=0.875)
Payment Source for past year treatment				
Paid by private insurance	-4.52 (p=0.046)	4.19 (p=0.268)	-6.18 (p=0.015)	10.21 (p=0.027)
Paid by Medicaid	0.10 (p=0.948)	8.31 (p=0.042)	-1.50 (p=0.322)	11.21 (p=0.011)
Paid without insurance	-1.73 (p=0.401)	-4.71 (p=0.302)	-0.98 (p=0.664)	-5.74 (p=0.258)
Cost Related Barriers to MH Treatment				
Cost barrier	-3.16 (p=0.181)	-6.28 (p=0.213)	-2.51 (p=0.318)	-3.87 (p=0.467)

Note:

DD coefficients represent the interaction between the target group and time (continuous variable for years – restricted to those prior to the DCP)

DDD coefficients represent the interaction between the target group, time (continuous variable for years – restricted to those prior to the DCP) and rural residence

Table B.2 Impact of DCP using Placebo Treatment group (26-29 years vs 30-34 years)

	Full sample DD _f	Rural DD _r	Urban DD _u	DDD
Any treatment	-0.79 (p=0.795)	-1.83 (p=0.786)	-0.63 (p=0.846)	-1.58 (p=0.822)
Type of Past Year Treatment				
Inpatient	1.59 (p=0.580)	-3.25 (p=0.566)	2.73 (p=0.370)	-3.63 (p=0.257)
Prescription	-0.13 (p=0.977)	-2.07 (p=0.776)	0.52 (p=0.915)	-0.37 (p=0.649)
Outpatient	4.24 (p=0.392)	-5.48 (p=0.568)	6.46 (p=0.210)	-10.12 (p=0.355)
Private doctor	-3.43 (p=0.263)	-5.20 (p=0.480)	2.81 (p=0.359)	-2.48 (p=0.744)
Private therapist	7.33 (p=0.097)	1.28 (p=0.874)	8.59 (p=0.062)	-6.14 (p=0.477)
MH clinic	-0.44 (p=0.916)	-17.68 (p=0.007)	3.24 (p=0.461)	-20.63 (p=0.003)
Medical clinic	-1.51 (p=0.436)	1.82 (p=0.624)	-2.21 (p=0.353)	4.41 (p=0.385)
Insurance Status				
Private	5.80 (p=0.175)	-10.22 (p=0.182)	-4.98 (p=0.314)	-4.98 (p=0.595)
Medicaid	1.64 (p=0.651)	0.75 (p=0.923)	1.84 (p=0.658)	-2.49 (p=0.793)
No insurance	-1.44 (p=0.697)	-1.65 (p=0.788)	-1.18 (p=0.764)	-0.56 (p=0.933)
Payer source for Past Year Treatment				
Paid by private insurance	-8.33 (p=0.154)	3.92 (p=0.726)	-11.08 (p=0.094)	16.84 (p=0.178)
Paid by Medicaid	6.95 (p=0.044)	-12.66 (p=0.205)	10.58 (p=0.007)	-26.03 (p=0.042)
Paid without insurance	1.44 (p=0.824)	9.58 (p=0.425)	0.04 (p=0.995)	13.93 (p=0.301)
Cost Related Barriers to MH Treatment				
MH cost barrier	-0.71 (p=0.906)	-1.43 (p=0.899)	-0.44 (p=0.944)	2.06 (p=0.852)

Table B.3 Impacts of the DCP using alternative age groups (22-25 vs 26-29)

	Full sample DD _f	Rural DD _r	Urban DD _u	DDD
Any treatment	3.66 (p=0.129)^	8.58 (p=0.109)^	2.85 (p=0.314)^	5.24 (p=0.415)
Type of Past Year Treatment				
Inpatient	-0.07 (p=0.976)	-2.60 (p=0.629)	0.80 (p=0.754)	-4.87 (p=0.443)
Prescription	-2.45 (p=0.434)	-6.06 (0.3.16)	-2.08 (p=0.555)	-2.88 (p=0.673)
Outpatient	6.48 (p=0.113)^	0.09 (p=0.990)	7.92 (p=0.079)	-9.07 (p=0.323)
Private Doctor	5.54 (p=0.056)	7.01 (p=0.237)	4.88 (p=0.097)	2.52 (p=0.689)
Private therapist	4.56 (p=0.245)^	-8.12 (p=0.230)	7.27 (p=0.099)	-16.74 (p=0.042)
Mental health clinic	1.83 (p=0.586)	9.96 (p=0.087)*	0.27 (p=0.940)	9.33 (p=0.157)
Medical clinic	1.10 (p=0.558)	-1.40 (p=0.674)	1.61 (p=0.470)	-3.36 (p=0.448)
Insurance Status				
Private	8.65 (p=0.000)	9.23 (p=0.104)^	8.45 (p=0.001)	1.26 (p=0.833)
Medicaid	-2.50 (p=0.168)	4.57 (p=0.256)	-3.58 (p=0.066)*	8.05 (p=0.065)
No insurance	-6.11 (p=0.017)	-12.48 (p=0.039)	-5.05 (p=0.047)	-7.76 (p=0.192)
Payer source for Past Year Treatment				
Paid by private insurance	15.76 (p=0.002)	5.77 (p=0.509)^	17.63 (p=0.001)	-12.06 (p=0.223)
Paid by Medicaid	-6.10 (p=0.080)*	11.44 (p=0.290)	-9.54 (p=0.008)*	23.84 (p=0.045)*
Paid without insurance	-1.48 (p=0.780)	-23.21 (p=0.027)	1.57 (p=0.800)	-23.94 (p=0.100)^
Cost Related Barriers to MH Treatment				
MH Cost Barrier	-7.06 (p=0.152)^	-20.29 (p=0.035)	-4.98 (p=0.342)	-13.32 (p=0.185)

^ No longer sig using alternative age groups

*Now significant using alternative age groups

Table B.4 Impact of DCP on Outcomes - 2010 surveys omitted

	Full sample DD _f	Rural DD _r	Urban DD _u	DDD
Any Mental Health Treatment				
Any treatment	4.03% (p=0.029)	9.78% (p=0.043)	2.88% (p=0.147)^	6.38% (p=0.236)
Type of Past Year Treatment				
Inpatient	0.60 (p=0.778)	-5.98 (p=0.115)	2.33 (p=0.338)	-9.28 (p=0.042)*
Prescription	-2.49 (p=0.233)	-2.33 (p=0.602)	-2.43 (p=0.281)	-0.02 (p=0.997)
Outpatient	6.56 (p=0.025)	-3.81 (p=0.496)	9.09 (p=0.008)	-13.10 (p=0.062)
Private Doctor	3.70 (p=0.116)	5.25 (p=0.228)	3.30 (p=0.195)	1.83 (p=0.697)
Private therapist	7.16 (p=0.013)	2.12 (p=0.682)	8.63 (p=0.015)	-6.68 (p=0.333)
MH clinic	-0.91 (p=0.642)	-5.78 (p=0.212)	0.01 (p=0.995)	-5.99 (p=0.247)
Medical Clinic	0.58 (p=0.658)	-0.93 (p=0.736)	1.00 (p=0.521)	-2.25 (p=0.490)
Insurance Status				
Private	10.19 (p=0.000)	9.37 (p=0.061)	10.43 (p=0.000)	-0.98 (p=0.856)
Medicaid	-0.10 (p=0.943)	7.26 (p=0.036)	-1.37 (p=0.360)	7.99 (p=0.040)
No insurance	-8.41 (p=0.000)	-17.31 (p=0.000)	-6.90 (p=0.000)	-9.98 (p=0.042)
Payer source for Past Year Treatment				
Paid by private insurance	10.50% (p=0.008)	14.28% (p=0.042)	10.16% (p=0.020)	4.05% (p=0.615)
Paid by medicaid	-0.25% (p=0.920)	13.88% (0.076)*	-2.56% (p=0.341)	14.98% (p=0.081)*
Paid without insurance	-1.48% (p=0.718)	-18.76% (p=0.034)	0.94% (p=0.832)	-17.21% (p=0.086)
Cost Related Barriers to MH Treatment				
MH Cost Barrier	-11.70% (p=0.007)	-20.12% (p=0.014)	-10.25% (p=0.021)*	-8.02% (p=0.320)

^ No longer sig (was sig with 2010 included)

*Now significant (was not with 2010 included)

APPENDIX C

Figure C.1 DSM-IV and DSM-V Criteria for Substance Use Disorders, reprinted from Hasin, et al. DSM-5 criteria for substance use disorders: recommendations and rationale. *American Journal of Psychiatry*, 170(8), 834-851.

	DSM-IV Abuse ^a		DSM-IV Dependence ^b		DSM-5 Substance Use Disorder ^c		
Hazardous use	X	} ≥ 1 Criterion	--	} ≥ 3 Criterion	X	} ≥ 2 Criterion	
Social/interpersonal problems related to use	X		--		X		
Neglected major roles to use	X		--		X		
Legal problems	X		--		X		
Withdrawal ^d	--		X		X		
Tolerance	--		X		X		
Used larger amounts/longer	--		X		X		
Repeated attempts to quit/control use	--		X		X		
Much time spent using	--		X		X		
Physical/psychological problems related to use	--		X	X			
Activities given up to use	--		X	X			
Craving	--		--	X			

a One or more abuse criteria within a 12-month period and no dependence diagnosis; applicable to all substances except nicotine, for which DSM-IV abuse criteria were not given.

b Three or more dependence criteria within a 12-month period.

c Two or more substance use disorder criteria within a 12-month period.

d Withdrawal not included for cannabis, inhalant, and hallucinogen disorders in DSM-IV. Cannabis withdrawal added in DSM-5.

APPENDIX D

Table D.1 Trends in Outcomes in Pre DCP Period (2007-2010)

	Full sample DD _f	Rural DD _r	Urban DD _u	DDD** DD _r – DD _u
Past Year Treatment				
Any SUD treatment	-0.88% (p=0.212)	-2.90% (p=0.225)	-0.51% (p=0.452)	-2.47% (p=0.300)
Type of past year treatment				
Doctors office	-4.48% (p=0.125)	-0.33% (p=0.915)	-5.63% (p=0.131)	3.29 (p=0.565)
Mental Health clinic	3.64% (p=0.308)	11.08% (p=0.111)	2.39 (p=0.489)	6.03% (p=0.311)
Rehab facility	0.31% (p=0.920)	10.58 (p=0.043)	-1.77 (p=0.608)	8.61% (p=0.204)
ED or Hospital	-1.84% (p=0.581)	-2.96 (p=0.607)	-1.27 (p=0.684)	-3.32% (p=0.539)
Payment for past year treatment				
Private insurance	1.49% (p=0.613)	6.24% (p=0.246)	0.88% (p=0.791)	4.40% (p=0.517)
Medicaid	-1.72% (p=0.576)	2.34% (p=0.595)	-2.18 (p=0.572)	4.56 (p=0.473)
Uninsured	0.18% (p=0.958)	-1.80% (p=0.789)	0.42% (p=0.915)	-3.15% (p=0.671)
Insurance status				
Private insurance	0.60% (p=0.601)	-0.33% (p=0.891)	0.67% (p=0.588)	-0.74% (p=0.779)
Medicaid	-0.31% (p=0.640)	-3.80% (p=0.022)	0.22% (p=0.755)	-4.20% (p=0.021)
Uninsured	0.21% (p=0.856)	3.17% (p=0.255)	-0.19% (p=0.878)	3.33% (p=0.271)
Cost related barriers to care				
	4.42% (p=0.325)	1.30% (p=0.886)	5.11% (p=0.291)	-4.63% (p=0.699)

* DD coefficients represent the interaction between the target group and time (continuous variable for years – restricted to those prior to the DCP)

** DDD coefficients represent the interaction between the target group, time (continuous variable for years – restricted to those prior to the DCP) and rural residence

Table D.2 Impact of DCP using Placebo Treatment group (26-29 years vs 30-34 years)

	Full sample DD _f	Rural DD _r	Urban DD _u	DDD DD _r – DD _u
Past Year Treatment				
Any SUD treatment	1.03 (p=0.617)	5.40 (p=0.237)	0.45 (p=0.837)	4.53 (p=0.389)
Type of past year treatment				
Doctors office	-2.20 (p=0.797)	-23.80 (p=0.137)	1.94 (p=0.837)	-24.43 (p=0.204)
Mental Health clinic	-5.88 (p=0.543)	-20.50 (p=0.253)	-2.25 (p=0.830)	-22.46 (p=0.332)
Rehab facility	-2.49 (p=0.813)	-2.48 (p=0.864)	-2.54 (p=0.824)	-3.16 (p=0.892)
ED or Hospital	8.68 (p=0.270)	-13.54 (p=0.421)	12.20 (p=0.147)	-23.71 (p=0.237)
Payment for past year treatment				
Private insurance	-1.84 (p=0.841)	-7.78 (p=0.690)	-1.13 (p=0.913)	-12.38 (p=0.648)
Medicaid	-3.23 (p=0.675)	10.01 (p=0.610)	-5.62 (p=0.448)	13.15 (p=0.514)
Uninsured	7.88 (p=0.376)	13.86 (p=0.489)	6.98 (p=0.468)	4.28 (p=0.838)
Insurance status				
Private insurance	0.66 (p=0.826)	-6.31 (p=0.390)	1.52 (p=0.618)	-6.72 (p=0.406)
Medicaid	-0.32 (p=0.878)	-1.71 (p=0.735)	0.02 (p=0.994)	-1.81 (p=0.723)
Uninsured	-0.92 (p=0.760)	3.41 (p=0.635)	-1.54 (p=0.632)	3.91 (p=0.626)
Cost related barriers to care				
	11.70 (p=0.468)	-6.91 (p=0.762)	8.34 (p=0.619)	0.04 (p=0.999)

Table D.3 Impact of DCP on Study Outcomes - 2010 surveys omitted

	Full sample DD _f	Rural DD _r	Urban DD _u	DDD DD _r – DD _u
Past Year Treatment				
Any SUD treatment	-0.38% (p=0.764)	0.46 (p=0.893)	-0.48 (p=0.720)	0.89 (p=0.811)
Type of past year treatment				
Doctors office	-0.94% (p=0.864)	10.80% (p=0.223)	-3.38% (p=0.575)	15.67% (p=0.129)
Mental Health clinic	0.82% (p=0.887)	26.51% (p=0.029)	-3.99% (p=0.526)	30.63% (p=0.022)
Rehab facility	-0.11% (p=0.984)	32.57% (p=0.002)	-5.53% (p=0.363)	41.04% (p=0.010)
ED or Hospital	1.29% (p=0.831)	37.19% (p=0.003)	-4.89% (p=0.480)	44.91% (p=0.003)
Payment for past year treatment				
Private insurance	5.21% (p=0.395)	19.43% (p=0.096)	1.75% (p=0.782)	22.97% (p=0.106)^
Medicaid	0.46% (p=0.912)	23.36% (p=0.019)	-4.40% (p=0.311)	27.29% (p=0.011)
Uninsured	-1.04% (p=0.872)	-8.47% (p=0.486)	-0.34% (p=0.960)	-5.59% (p=0.669)
Insurance status				
Private insurance	8.79% (p=0.000)	9.02% (p=0.051)	8.72% (p=0.000)	0.51% (p=0.918)
Medicaid	0.77% (p=0.523)	0.88 % (p=0.764)	0.73% (p=0.594)	-0.22% (p=0.948)
Uninsured	-10.05% (p=0.000)	-11.83% (p=0.013)	-9.75% (p=0.000)	-1.72% (p=0.739)
Cost related barriers to care				
	-14.83 (p=0.051)	-43.27 (p=0.013)	-8.13% (p=0.348)^	-37.31% (p=0.077)*

^ No longer sig (was sig with 2010 included)

*Became significant (was not with 2010 included)

Table D.4 Impacts of the DCP using alternative treatment and comparison age groups (22-25 vs. 26-29)

	Full sample DD _f	Rural DD _r	Urban DD _u	DDD DD _r – DD _u
Unweighted N				
22-25	13,337	2,602	10,735	--
26-29	3,317	640	2,677	--
Past Year Treatment				
Any SUD treatment	-0.46% (p=0.750)	0.05% (p=0.991)	-0.65% (p=0.686)	1.34% (p=0.766)
Type of past year treatment				
Doctors office	2.72% (p=0.678)	23.22% (p=0.060)*	-0.56% (p=0.940)	25.68% (p=0.069)
Mental Health clinic	0.16% (p=0.980)	16.76% (p=0.214)^	-2.88% (p=0.699)	21.69% (p=0.240)^
Rehab facility	2.66% (p=0.754)	33.78% (p=0.024)	-1.94% (p=0.829)	36.92% (p=0.073)
ED or Hospital	-2.29% (p=0.763)	36.00% (p=0.004)	-8.84% (p=0.289)	50.98% (p=0.001)
Payment for past year treatment				
Private insurance	1.83% (p=0.779)	25.17% (p=0.057)	-3.93% (p=0.576)	35.43% (p=0.021)
Medicaid	2.40% (p=0.678)	12.37% (p=0.436)	-0.80% (p=0.889)	15.32% (p=0.349)
Uninsured	-7.86% (p=0.321)	-7.97% (p=0.603)	-8.42% (p=0.315)	3.38% (p=0.835)
Insurance status				
Private insurance	8.58% (p=0.000)	11.89% (p=0.052)	8.15% (p=0.001)	3.84% (p=0.576)
Medicaid	0.95% (p=0.558)	2.34% (p=0.545)	0.65% (p=0.718)	1.92% (p=0.654)
Uninsured	-10.07% (p=0.000)	-13.19% (p=0.024)	-9.49% (p=0.000)	-4.18% (p=0.504)
Cost related barriers to care				
	-25.87% (p=0.036)	-29.39% (p=0.169)^	-18.70% (p=0.177)^	-19.45% (p=0.439)

*Now significant (not in main model)

^ No longer significant (was in main model)