

UC Irvine

UC Irvine Electronic Theses and Dissertations

Title

The Affordable Care Act: Disparities in Emergency Department and Hospital Use for Mental Health Diagnoses In Young Adults

Permalink

<https://escholarship.org/uc/item/4bt0847k>

Author

Yanuck, Justin Lee

Publication Date

2015

Copyright Information

This work is made available under the terms of a Creative Commons Attribution License, available at <https://creativecommons.org/licenses/by/4.0/>

Peer reviewed|Thesis/dissertation

UNIVERSITY OF CALIFORNIA,
IRVINE

The Affordable Care Act: Disparities in Emergency Department and Hospital Use
for Mental Health Diagnoses In Young Adults

THESIS

submitted in partial satisfaction of the requirements
for the degree of

MASTER OF SCIENCE

in Biomedical and Translational Science

by

Justin Lee Yanuck

Thesis Committee:
Assistant Professor Dr. Bharath Chakravarthy, Chair
Research Specialist Dr. Craig Anderson
Assistant Professor Dr. John Billimek

2015

TABLE OF CONTENTS

LIST OF FIGURES	iii
LIST OF TABLES	iv
ACKNOWLEDGMENTS	v
ABSTRACT OF THE THESIS.....	vi
INTRODUCTION	1
PREVIOUS LITERATURE	3
METHODS	8
RESULTS	13
DISCUSSION.....	26
REFERENCES	34
APPENDIX	41

LIST OF FIGURES

	Page
Figure 1.....	13
Figure 2.....	19

LIST OF TABLES

	Page
<i>Table 1</i>	15
<i>Table 2</i>	17
<i>Table 3</i>	18
<i>Table 4</i>	21
<i>Table 5</i>	23
<i>Table 6</i>	25

ACKNOWLEDGMENTS

I would first like to thank Dr. Kaplan, Dr. Greenfield, and everyone involved in the MS-BATS program for teaching me this year what it takes to conduct sound research, and how to critically evaluate other people's research in order to be a more informed clinician.

I would also like to thank my committee members starting with my chair Dr. Bharath Chakravarthy. His weekly guidance over the last year, has enabled this vague research idea I had become the full-fledged thesis that is today. His ability to get me to think about the "big picture," ensured that this thesis stayed focused and did not stray too far from my original research question. I am inspired to one day follow in his suit and be an emergency medicine doctor that not only treats patients, but also conducts large amounts of research to further the field of emergency medicine. I would also like to thank another committee member Dr. Craig Anderson, who provided me with crucial guidance on how to conduct and conceptualize my research questions. And my last committee member, Dr. John Billimek, not only taught me everything I know about statistics, but ultimately provided me with step-by-step guidance on how to effectively set up my data to analyze the research questions I was interested in.

Finally, I would like to thank my family and friends, for putting up with my stresses surrounding the completion of this project, as well as ensuring I have adequate balance in my life.

ABSTRACT OF THE THESIS

The Affordable Care Act: Disparities in Emergency Department and Hospital Use for Mental Health Diagnoses In Young Adults

By

Justin Lee Yanuck

Master of Science in Biomedical and Translational Science

University of California, Irvine, 2015

Assistant Professor Dr. Bharath Chakravarthy

One of the first provisions of the Affordable Care Act to be implemented allowed young adults to remain on their parents' insurance plans until the age of 26. This study estimated the association between the dependent coverage provision and changes in young adults' usage of Emergency Department (ED) and Hospital services for psychiatric diagnoses. We utilized a Quasi-Experimental Analysis of ED use and inpatient admissions in California from 2009-2011 for behavioral health diagnosis of individuals aged 19 to 31-years old. Analyses used a difference-in-differences approach comparing those targeted by the ACA dependent provision (19 to 25-year-olds) and those who were not (27 to 31-year-olds), evaluating changes in ED/Inpatient visit rates per 1,000 in California. Primary outcome measures included the quarterly ED/Inpatient visit rates with any psychiatric diagnosis, with subgroup analysis looking at the effects of race and gender on the primary outcome. It was found that while the young adult dependent provision was associated with 0.05 per 1,000 people ($p < 0.001$) fewer psychiatric ED visits among the treatment group (19 to 25-year-olds) compared to the control group (27 to 31-year-olds), this significant reduction in psychiatric ED visits was not seen in males, hispanics, asians or pacific islanders. Furthermore, hispanics, asians, and pacific islanders were the only racial subgroups that did not see gains in the proportion of psychiatric ED visits covered by private insurance. Additionally, inpatient visit rates did not significantly change in the treatment group relative to the control group, however after stratification, rates significantly increased for males, whites, blacks, and mixed/other racial groups. While the source of admission from the ED did not significantly change in the treatment compared to the control group, admissions from sources other than the ED significantly increased overall, as well as for whites, blacks, mixed/other, and females. Ultimately, our research has shown that in one of the earliest aspects of the ACA, gender, and racial disparities exist.

INTRODUCTION

In 2010, there were roughly 51 million uninsured adults in the United States, and while lack of health insurance limits access to many aspects of health care, Emergency Departments (EDs) are mandated to provide care to all patients regardless of insurance status [1-3]. In the United States, use of EDs has steadily increased. From 1991 to 2011, the number of annual visits to EDs rose 46%, and in 2011 ED costs accounted for 2-10% of the total cost of US health care [4-5]. While the range of presenting complaints to the ED is vast, psychiatric related ED visits represent a large component of ED users. In 2006, 20% of adult ED visits carried a primary psychiatric diagnosis: that equates to nearly 4.7 million visits a year [6]. After years of mental health insurance carve outs and the implementation of the Emergency Medical Treatment and Active Labor Act, EDs gradually became primary and acute care providers for mental health patients [7-10].

On March 23, 2010, the Patient Protection and Affordable Care Act (PPACA) was enacted, which contained provisions that: expanded health insurance coverage for patients with mental health care needs through Medicaid expansions, allowed young adults age 19 to 25 to stay as dependents on their parent's plans, and established health insurance exchanges for cheaper and more expedient insurance purchasing [11-12]. These reforms and others are expected to insure at least 3.7 million previously uninsured patients of all ages with severe mental illnesses, and even more with less severe mental illnesses [13]. While mental illnesses span all age groups, the odds of having a year long DSM-IV disorder are higher for individuals aged 18-29 years than any other age group, and a majority of mental health disorders emerge by age 24 [13-14]. The provision allowing young adults to stay as dependents on their parents' plans until their 26th birthday, was one of the first provisions of the PPACA to come into effect. On September 23,

2010 this provision started being enforced. Since this provision went into effect, there have been significant increases in insurance coverage for the 19-25 year old age group [15-22].

However, while this age group has seen large increases in insurance coverage, there is little consensus on the overall effect of insurance expansion on ED and inpatient hospital use. Where some studies show vast increases in use of hospital services others have shown large decreases in use [23-28]. Since the young adult dependent provision of the PPACA went into place late in 2010, studies have analyzed its effects with regards to ED and inpatient use. Preliminary results suggest an increase in ED and inpatient use, however considerable variability exists [29-34]. Studies have looked into the effects of insurance expansion on mental health care related use of ED and hospital services with overall mixed findings [30-35]. These studies primarily focused on overall use of ED and inpatient services by young adults; no studies have examined the differential effect of this particular provision on mental health care use for ED and inpatient services with a focus on stratifying this young adult cohort by sex and race.

While the young adult dependent provision was designed to reduce the proportion of 19 to 25 year olds who were uninsured, early studies have shown that these effects are not the same when stratifying by race. These studies reveal that while young adult white, black, hispanic, asian/pacific islander, and native americans all experienced an increase in insurance coverage, the net increases were variable and ultimately inconsistent between articles [36-37]. This lack of consistency necessitates further exploration, and it this study's aim to help clarify this fundamental impact. As the PPACA expands in the coming years, it is important to study its effects not just on the country as a whole, but various populations within the country. Using California as a model state, our study aims both to examine the differential impact of the young adult PPACA dependent provision on ED and inpatient use for mental health needs as well as

analyze the impact of this provision on the use of ED and inpatient services for mental health care needs in young adults as stratified by both gender and race.

Previous Literature

Given that the young adult dependent provision was one of the first aspects of the PPACA to be implemented, many have used the results from this provision to predict the overall effect the PPACA will have once its main tenets are implemented in 2014. Yet currently in 2015, there is no overall database available to look at the effects of the most recent PPACA provisions. Therefore, the main effects of this young adult provision are well studied. What follows is a summary of the main foundational studies that have analyzed the effects of the young adult dependent provision, and where appropriate, a glimpse into what our study aims to add to this literature.

The Effect of the Young Adult Dependent Provision on the Insurance Status of Young Adults:

It is widely agreed that the young adult dependent provision is associated with large gains in insurance coverage for young adults, 19 to 25 years-old. These young adults, saw a 3% to 10% increase in insurance coverage after the implementation of the young adult dependent provision was implemented in 2011 (15-22). Though problematically, these studies were forced to utilize data which rarely included time periods after 2011, these early results are likely to increase with time as young adults and parents learn about this provision of the PPACA, and as insurance plans evolve to adopt this provision in the future.

Previous State Level Dependent Provisions Compared to the PPACA Dependent Provision:

While many states previously had some form of dependent coverage for young adults, studies have shown that a majority of these state laws were much weaker than the young adult dependent provision of the PPACA [38-39]. Rather than cover young adults until their 26th birthday, many states had lower age cut-offs for dependent status. Further, many of the state laws did not apply to policies self-funded by the young adults, and some states had even more stringent laws such as the requirement to be a full-time student, or living with one's parents. This lack of robustness in the state's laws likely explains why studies [38-39] found the dependent provisions at the state level lead to only minor increases in dependent coverage that were largely offset by a decline in young adults holding their own policies. Conversely, the young adult dependent provision of the PPACA applied to all young adults until their 26th birthday, and all employer-provided plans. It is likely the differences between the PPACA versus the existing state laws that make the effects of this young adult provision much stronger, and have lead to the early signs of insurance gains at the national level.

Effects of Insurance Expansion on ED and Inpatient Hospital Use:

Ultimately, the effect of new insurance coverage for young adults is not clear. While a reduction in cost and moral hazard would suggest an increased consumption of health care for these young adults, it could also be argued that for conditions that are amenable to outpatient care, as most psychiatric conditions are, increased coverage lends itself to better outpatient care and thus less acute events in need of emergency or inpatient use.

While many studies have looked at the effects of insurance expansion on health care utilization, the results from these studies vary. In studies looking at the effects of Oregon's health insurance expansion in 2008 where uninsured low-income adults in Oregon were selected by

lottery to be given the chance to apply for Medicaid, the results showed that with greater insurance coverage there was an overall increase in health care utilization ranging from preventive care to inpatient care [23, 40]. This increase in health care utilization suggests a reduction in cost as well as the moral hazard associated with insurance expansion may lead to increased hospital utilization, though other studies dispute this. In a study looking at the effects of the young adult provision on ED use as whole in California, New York and Florida, the young adult dependent provision was found to be associated with a 2.1% reduction in ED visits in the 19 to 25 year-old group relative to an older control group [29].

While the above studies look at the effects of insurance coverage on health care use for all health conditions, there have also been studies that analyze the effects of insurance expansion on health care utilization for patients carrying behavioral health diagnoses. One study looking at the effects of the Massachusetts health care law, which the PPACA was largely modeled after, found 19 to 25 year-olds in Massachusetts saw a relative reduction in inpatient admissions and ED visits for psychiatric purposes [35]. However this study also notes, the Massachusetts mental health system has nearly 2.5 times more psychiatrists per 100,000 individuals than rest of the United States, and therefore Massachusetts had a larger capacity to deal with the increased outpatient care that could arise with the insurance expansion.

Other studies looking at the effects of the PPACA young adult dependent provision on mental health care use nationally have mixed findings. A study looking at the effects of the PPACA dependent provision on psychiatric inpatient use nationally, and psychiatric ED use in California, showed the 19 to 25 year-old age group, when differentially compared to the 26 to 29 year-old age group, saw a statistically significant relative increase in inpatient admissions nationally, and a statistically significant relative decrease in ED visits in California [30]. Another national study,

showed 19 to 25 year-olds, after the young adult dependent provision was put in place, saw a relative increase in mental health care admissions of 9% compared to 27-29 year olds [32]. When combined these studies, suggest a reduction in ED visits and an increase in inpatient admissions for mental health care purposes in the young adult cohort after the young adult dependent provision was enacted.

Effects of the Young Adult Dependent Provision by Gender and Race:

While studies [30, 36, 41] have shown that both 19 to 25 year-old men and women have made similar gains in health insurance coverage after the young adult dependent provision, these gains have not necessarily lead to equal utilization of medical services for mental health reasons. There has been evidence that while the young adult dependent provision is associated with a statistically significant decrease in ED utilization by woman, men have seen a statistically significant jump in inpatient admissions [30]. While it could be hypothesized from this that woman are utilizing outpatient care more effectively than men, this fact has not been tested yet.

Preliminary studies are mixed regarding the insurance expansion of this young adult dependent provision by race. Overall, the results trend towards an increase in insurance coverage for whites, blacks, hispanics, asians, and native americans in the 19 to 25 year-old group relative to their older race congruent counterpart [36, 41]. The results appear to show relatively larger gains in insurance coverage for whites relative to non-whites. Currently, no study has examined the differential effects of the young adult dependent provision on psychiatric ED and inpatient hospital utilization stratified by race.

Ultimately our research makes multiple contributions to the scientific community. We plan to be the first to look at the varying effects this young adult dependent provision specifically has on

mental health care ED and inpatient utilization for young adults of different races. We suspect that although preliminary studies have shown gains in most racial groups following the young adult dependent provision [36,41], these gains do not uniformly predict how each race will utilize mental care services now that they have gained insurance. Insurance acquisition does not ensure access to outpatient care. This study hopes to elucidate the varying ED and inpatient use patterns for mental health care purposes following the young adult dependent provision. With this, interventions can be made to address these disparities and ensure that this crucial provision of the PPACA is not biasing against, or underutilized by, non-white racial sub-groups.

Finally, we hope to further explore the varying utilization patterns by gender of psychiatric ED and inpatient admissions for young adults following the PPACA dependent provision. While women and men have both been shown to make large gains in insurance coverage following the provision [30, 36, 41], there is little evidence [30] regarding their health care use patterns for psychiatric purposes following this provision. We aim to add to the literature about possible gender differences that exists in health care utilization with the hopes that any differences found could lead to interventions that can ensure both genders are able to take full advantage of their insurance gains through this young adult dependent provision.

Ultimately our research aims to take a comprehensive look at the early post-PPACA landscape, and assess whether one of its first provisions to be implemented is having equal effects across different genders and racial groups.

Methods

Data:

We chose to use data from the California State Inpatient Databases (SIDs) and State Emergency Department Databases (SEDDs) through the Healthcare Cost and Utilization Project of the Agency for Health care Research and Quality [42-43]. California was chosen for analysis due to its diversity, large population, and data availability for the years 2009-2011. These two databases combine to give a picture of all ED visits that either result in an admission or do not result in an admission (either due to treat and release, or transfer to another hospital). Although other databases exist, we chose to use these databases to remain consistent with what other studies have used to explore PPACA effects on this young adult population. The data from California's SIDs and SEDDs both include: the patient's demographic characteristics, diagnosis and procedure information, admission and discharge status, expected payment source, hospital characteristics, and a link variable that allows for the patient's health care use to be tracked across encounters [42-43]. While SID's excludes substance use treatment facilities, most mental health inpatient admissions occur in non-specialty community hospitals [25]. Both databases contain information on health insurance status such as Medicaid, Medicare, private insurance, other insurance, and self-pay; however, it is not possible with this data to determine if treated young adults are dependents on their parents' health insurance plan, or those who have their own Employee Subsidized Insurance (ESI) or non-group insurance.

Statistical Analysis:

For our main analysis, we obtained California State level data on all ED visits and admissions made by people ages 19 to 31 from January 1, 2009, to December 31, 2011. With this data we compared, using a difference-in-differences approach [16, 29-32], ED use and inpatient admissions for young adults ages 19 to 25 and 27 to 31 where the visits or admission carried a primary diagnosis of a mental health disorder. The difference-in-differences approach allows us to account for time-varying factors that would have led the treatment group (19 to 25 year-olds) to experience different rates of ED and inpatient care compared to the control group (27 to 31 year-olds) after the young adult dependent provision was implemented. By taking the difference in rates of ED or inpatient use in the treatment group before and after the implementation of the young adult dependent provision, and subtracting this number by the difference in rates of ED and inpatient use in the control group before and after implementation of the young adult dependent provision, these time varying trends are accounted for to the best of our ability.

We defined the pre-PPACA period Sept 1, 2009 through to August 31st, 2010, and we defined the post-PPACA period as January 1, 2011 through to December 31, 2011. As other studies have done [17,26], we used September 1, 2010 through to December 31, 2010 as a wash out period to account for the fact that although the young adult dependent provision aspect of the PPACA went into place on September 23, 2010, many plans are only renewed at the beginning of the new year. We exclude 26 year-olds from our study, as some types of health insurance allow 26 year-olds to stay on their parents' plans until the end of the calendar year of their 26th birthday, and thus it is difficult to assign them to either group confidently. We determined that adults 27 to 31 years-old served as suitable controls as they carry similar lack of coverage and similar mental health concerns as the younger 19 to 25 year-old treatment group [30]. By

gathering data from 2009, we were able to analyze and control for any possible trends in mental health care use prior to implementation of the young adult provision on September 23, 2010. Mental health disorders were sub-classified into 4 mutually exclusive categories: 1) depression, 2) substance use disorder, 3) psychosis, 4) all other psychiatric conditions as described in Table S1. With this data and baseline comparative structure in place, we analyzed the effects that the young adult dependent provision of the PPACA had on mental health care use of ED and inpatient services among different genders and races.

For our primary analysis, we measured rates of ED visits and inpatient admissions for patients carrying a primary diagnosis of a non-childbirth-related psychiatric illness. Any non-pregnant patient fitting our age restrictions and carrying a primary diagnosis of an ICD-9 code 290.xx to 319.xx, was included in our analysis of these two outcomes. In line with previous studies [26,30,35] that have analyzed PPACA effects on this population, we measured all rates as visits/admissions per 1,000 population based off of US Census Bureau data [44]. We created 1,620 “cells” defined by sex, age (19 to 25, 27 to 31), race (white, black, hispanic, asian/pacific islander, native american, other/mixed), and quarter (for 2009-2011). In each cell, the numerator reflects the total admissions or visits for that specific sex-age-race-quarter group. The denominator is the US Census Bureau’s California estimate of the population subgroup that corresponds to the specific sex-age-race-quarter make-up of the corresponding numerator derived from the California SEDD and SID.

Following the analysis of this primary outcome, we sought to do subgroup analyses looking at the effects that race, gender, and source of payment had on the primary outcome of ED visit rates and inpatient admissions. These subgroup analyses would allow us to test if this young adult dependent provision was equally affecting both genders and all of the races represented in the

data, and whether certain races were experiencing differential increases in the proportion of ED visits and inpatient admissions that were paid for with private insurance.

In order to test our primary outcome we estimated the following linear regression model:

$$Y_{agtz} = \beta_1 + \beta_2(\text{Enact}_t) + \beta_3(\text{Implement}_t) + \beta_4(\text{Treatment}_a * \text{Enact}_t) + \beta_5(\text{Treatment}_a * \text{Implement}_t) + \beta_6\text{Age}_a + \beta_7\text{Race}_z + \beta_8\text{Quarter}_t + \beta_9\text{Gender}_g + \epsilon_{agtz},$$

where Y_{agtz} is our outcome variable of interest for age a , gender g , race z , and quarter t . Enact_t represents an indicator variable for quarter 2 and quarter 3 of 2010, corresponding to the time period after the young adult dependent provision was enacted, but before it was implemented. Implement_t represents the indicator variable for quarters 1 through quarter 4 of 2011, corresponding to the time period after the young adult dependent provision was implemented, and allowing for the 4th quarter of 2010 to be a washout period. Quarter 4 of 2011, represents the latest period of available data. The variable Treatment_a is a dichotomous variable for membership in the 19 to 25 year-old age group, relative to the 27 to 31 year-old age group. In the non-interacted variable Age_a we include a full set of age indicators.

The interaction of Treatment_a with Enact_t captures the possible anticipatory changes between the time the law was enacted and the implementation of the law, approximately from late March to late September. The interaction of Treatment_a with Implement_t , captures the average impact after the law was implemented by comparing ED visits and admission rates in the treatment group relative to the control group after the young adult dependent provision was in effect. We also include dummy variables for year and quarter into the variable Quarter_t to account for seasonality and any year-fixed effects that are common to either the treatment or control groups. Dummy variables for race and gender are designed to account for any effects that race and gender have on the primary outcome independent of our true variable of interest,

$(\text{Treatment}_a * \text{Implement}_t)$. ϵ_{agtz} represents the difference in the regression line of best fit and the true data points used to build this model.

This same filtered data was used to assess the proportion of ED visits and inpatient admissions for each race that was covered by private insurance, as well as the proportion of admissions for each race that were admitted through the ED or from another external source. An indicator variable for private insurance was interacted with the $(\text{Treatment}_a * \text{Implement}_t)$ interacted variable to yield a model that would allow us to look at this differential effect of the young adult dependent provision on the proportion of ED visits and admissions that were paid for with private insurance in the 19 to 25 year-old group, relative to the 27 to 31 year-old group, by race. Finally, an indicator variable for admission source (from the ED or from another external source), was interacted with the $(\text{Treatment}_a * \text{Implement}_t)$ interacted variable to yield a model that would allow us to look at this differential effect of the young adult dependent provision on the proportion of admissions that came from the ED versus an external source in the 19 to 25 year-old group, relative to the 27 to 31 year-old group, by race. We estimated our linear regression models with robust Huber-White standard errors, and p values were reported based on two-tailed t statistics.

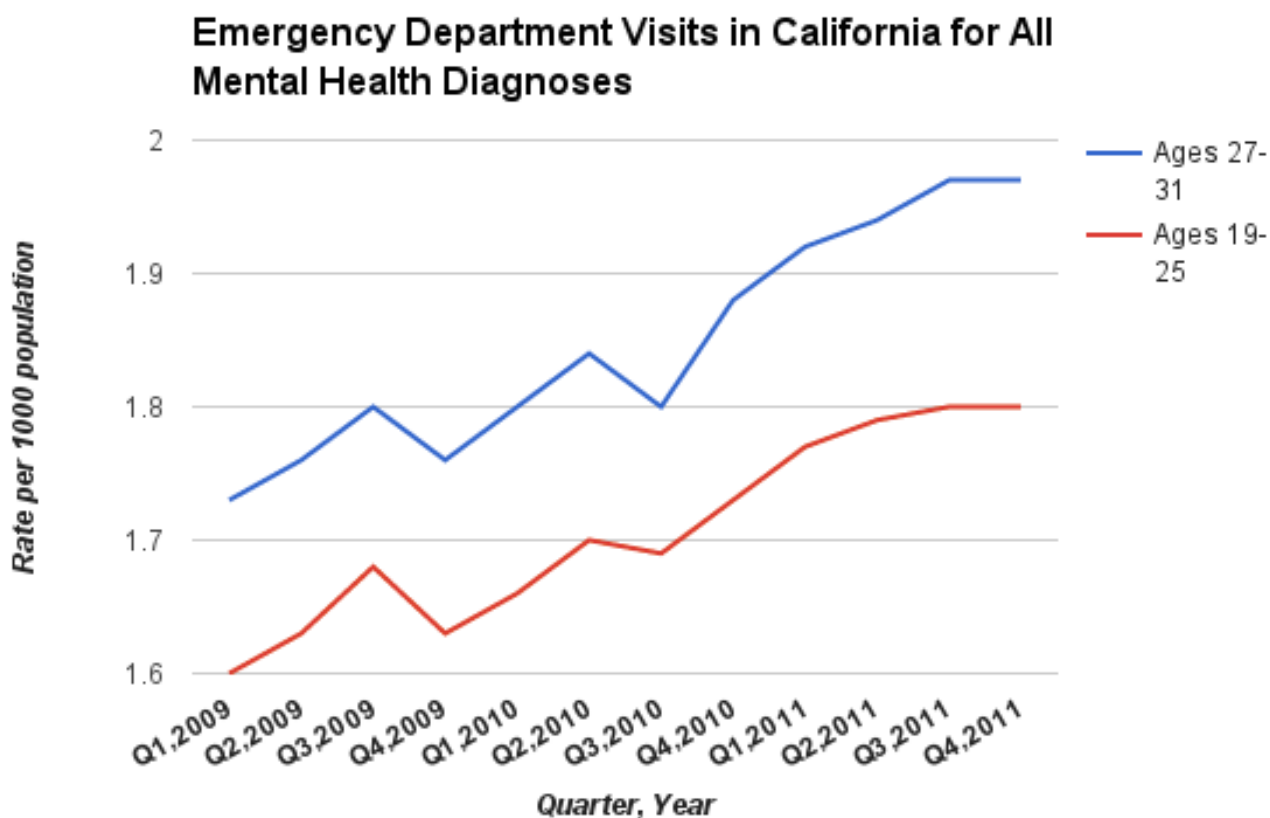
This University of California, Irvine Institutional Review Board (IRB) deemed this study IRB exempt because it uses de-identified secondary data.

Results

California Psychiatric ED Visits:

We first present visual trends of our main analysis looking at the differential rates of ED visits between the treatment and control groups in Figure 1. The law was enacted during the second quarter of 2010, and the law was implemented during the fourth quarter of 2010. Trends in outcomes, as shown in Figure 1, for the treatment and control group were similar throughout the study period, validating the difference-in-difference research design. Currently the data for the post-PPACA arm only exists up to 2011, and therefore we were only able to analyze 4 quarters post-PPACA implementation, using the fourth quarter of 2010 as a wash-out period.

Figure 1. Quarterly Emergency Department Visit Rates, 2009-2011^a



^a Quarterly ED visits rates that did not result in an Inpatient Admission. The Law was enacted Q2, 2010, and Implemented Q4, 2010.

Table 1 reports sample means for the treatment and control groups throughout the entirety of the study period. Overall, the treatment group had lower rates of ED utilization for psychiatric reasons compared to the control group. Within each age-group and gender-group, blacks had the highest average rate of ED use, followed closely by whites. Native americans and asian/pacific islanders consistently had the lowest rates of ED use for psychiatric purposes. Males in both age groups, and among all races, had higher rates of ED visits. Across both gender and age group, diagnoses of substance use disorders made-up a majority of the ED visits, and diagnoses of psychosis and depression were closely matched.

Table 1. California ED Psychiatric Visit Characteristics, 2009-2011

Characteristic	Ages 19-25			Ages 27-31		
	Full Sample	Males	Females	Full Sample	Males	Females
ED visit rates per 1,000 population ^a	Rate(SD)	Rate(SD)	Rate(SD)	Rate(SD)	Rate(SD)	Rate(SD)
Race:						
All Races	1.70(0.77)	1.86(0.85)	1.55(0.70)	1.85(0.85)	2.03(1.06)	1.65(0.72)
White	1.90(0.26)	1.99(0.16)	1.75(0.14)	1.79(0.24)	1.92(0.17)	1.65(0.12)
Black	2.36(0.34)	2.36(0.25)	2.35(0.21)	2.75(0.36)	2.84(0.27)	2.65(0.22)
Hispanic	1.07(0.18)	1.18(0.15)	0.99(0.12)	1.09(0.18)	1.19(0.14)	0.99(0.10)
Asian/Pacific Islander	0.36(0.06)	0.35(0.13)	0.34(0.13)	0.36(0.06)	0.35(0.04)	0.42(0.05)
Native American	0.60(0.13)	0.59(0.09)	0.61(0.08)	0.71(0.21)	0.62(0.16)	0.75(0.17)
Mixed/Other	1.73(0.27)	1.95(0.21)	1.52(0.19)	2.03(0.31)	2.25(0.23)	1.82(0.16)
ED Visit with diagnosis (dx) of:						
Any psychiatric dx	1.70(0.77)	1.86(0.85)	1.55(0.70)	1.85(0.85)	2.03(1.06)	1.65(0.72)
Depression dx only^b	0.45(0.08)	0.29(0.05)	0.57(0.17)	0.50(0.26)	0.32(0.11)	0.66(0.28)
Substance use dx only	4.22(0.50)	4.87(0.89)	3.61(0.40)	4.42(0.55)	5.21(0.94)	3.67(0.43)
Psychosis dx only	0.55(0.10)	0.73(0.15)	0.45(0.08)	0.68(0.16)	0.82(0.25)	0.56(0.18)
Any other psychiatric dx	2.8(0.34)	2.51(0.60)	2.98(0.70)	3.13(0.39)	2.81(0.64)	3.39(0.79)
	N	N	N	N	N	N
Total ED Visits	158,873	87,195	71,678	109,532	60,495	49,037

^a ED visit rates were calculated using age, sex, race and quarterly specific estimates from the US Census Bureau's state-level population estimates as the denominator. For each denominator, a specific age, sex, race and quarterly amount of ED visits made up the corresponding numerator.

^b Any diagnosis category with "only", refers solely to that specific psychiatric diagnosis, it may include other physical diagnoses as well.

While the overall growth rate for California psychiatric ED visits rises over the extent of the three-year study period, the growth rate is significantly lower for the 19 to 25 year-old age group following the implementation of the young adult dependent provision compared to the 27 to 31 year-old age group (Table 2). Growth in ED visits not leading to inpatient admissions was 0.05 per 1,000 people ($p < 0.001$) lower among 19 to 25 year-olds compared to 27 to 31 year-olds. This differential reduction was only seen to be significantly different in the period following the implementation of the law, where the enactment period, March through September of 2010, did not have a significant differential effect on ED visits between age groups ($\beta_1 = -0.01$, $p = 0.36$). The difference in rates of ED use following the implementation of the dependent expansion was found to be significant for females ($\beta_1 = -0.07$, $p < 0.001$), but not for males ($\beta_1 = -0.01$, $p = 0.19$).

The significant differential reduction in ED visit rates following the implementation of the young adult dependent provision in 19 to 25 year-olds compared to 27 to 31 year-olds was not equally mirrored by all racial groups. While 19 to 25 year-old whites ($\beta_1 = -0.03$, $p < 0.001$), blacks ($\beta_1 = -0.04$, $p < 0.001$), native americans ($\beta_1 = -0.05$, $p = 0.02$), and mixed/other ($\beta_1 = -0.03$, $p < 0.001$) racial groups saw significant declines in ED visit rates relative their race congruent control group, hispanics ($\beta_1 = 0.01$, $p = 0.51$) and asian/pacific islanders ($\beta_1 = -0.02$, $p = 0.20$) did not. No racial groups saw a significant differential change in ED visits rates during the enactment period.

Table 2. Differential Change in Emergency Department Visits With Mental Health Diagnoses per 1,000 Population for 19 to 25 Year-Olds Compared to 27 to 31 Year-Olds After Enactment of the Affordable Care Act Dependent Coverage Provision^a

	Enactment Effect, 2010 (Q2-Q3)			Implement Effect, 2011 (Q1-Q4)		
Outcome	Enactment Effect	95% CI	p	Implementation Effect	95% CI	p
All ED Visits:	-0.01	-0.24, 0.09	0.36	-0.05	-0.03, 0.00	<0.001
ED Visits By Race ^b :						
White	-0.02	-0.03, 0.00	0.11	-0.03	-0.04, -0.01	<0.001
Black	-0.03	0.00, 0.05	0.12	-0.04	-0.06, -0.03	<0.001
Hispanic	-0.01	-0.02, 0.03	0.63	0.01	-0.01, 0.03	0.51
Asian/Pacific Islander	-0.02	-0.03, 0.01	0.20	-0.02	-0.03, 0.01	0.20
Native American	0.03	-0.01, 0.05	0.15	-0.05	-0.07, -0.03	0.02
Mixed/Other	0.02	0.00, 0.04	0.09	-0.03	-0.04, -0.01	<0.001
Females:						
Female ED Visits	-0.01	-0.02, 0.01	0.36	-0.07	-0.07, -0.06	<0.001
Males:						
Male ED Visits	0.00	-0.01, 0.01	0.49	-0.01	-0.02, 0.01	0.19

^aThis table represents the coefficient estimates for the 19 to 25 year-old age group interacted with an indicator for the enactment period (2nd and 3rd quarters, 2010), and the implement period (1st through 4th quarters, 2011) in regression models of ED visit rates, controlling for age, sex, quarter, and where appropriate race. Values for p are based on two-tailed t statistics, and confidence intervals are based on robust Huber-White standard errors.

^bCoefficient estimates by race were calculated from the master data file filtering for a specific race and then running the same regression as stated above without controlling for race.

Following the expansion of the young adult dependent provision, the proportion of ED visits that were uninsured fell by 3.5% ($p < 0.001$). However, Table 3 reveals that following the implementation of the young adult dependent provision there was no overall differential increase in the share of psychiatric ED visits with private insurance among the 19 to 25 year-olds compared to the 27 to 31 year-olds ($\beta_1 = 0.02$, $p = 0.603$). While there was no overall increase in

the share of ED visits covered by private insurance, certain races did see differential increases in private insurance. 19 to 25 year-old whites ($\beta_1=0.08$, $p<0.001$), blacks ($\beta_1=0.05$, $p=0.003$), mixed/other ($\beta_1=0.05$, $p<0.001$) and native americans ($\beta_1=0.03$, $p<0.001$) all saw differential increases in the share of their psychiatric ED visits that were paid for with private insurance compared to 27 to 31 year-olds. However, hispanics ($\beta_1=0.01$, $p=0.694$) and asian/pacific islanders ($\beta_1=-0.01$, $p=0.796$) did not see a significant differential change in the share of ED visits paid for with private insurance.

Table 3. Differential Change in Likelihood that ED Visits with Behavioral Health Diagnoses for 19-25 Year Olds Compared to 27-31 Year Olds are Covered by Private Insurance, After Implementation of Dependent Coverage Provision^a

		Implement Effect, 2011 (Q1-Q4)	
Outcome	Coefficient Estimate	95% CI	p
Full Sample			
All ED Visits	0.02	-0.01, 0.05	0.603
ED Visits By Race^b:			
White	0.08	0.05-0.11	<0.001
Black	0.05	0.02, 0.08	0.003
Hispanic	0.01	-0.02, 0.04	0.694
Asian/Pacific Islander	-0.01	-0.04, 0.03	0.796
Native American	0.03	0.01, 0.04	<0.001
Mixed/Other	0.05	0.02, 0.08	<0.001

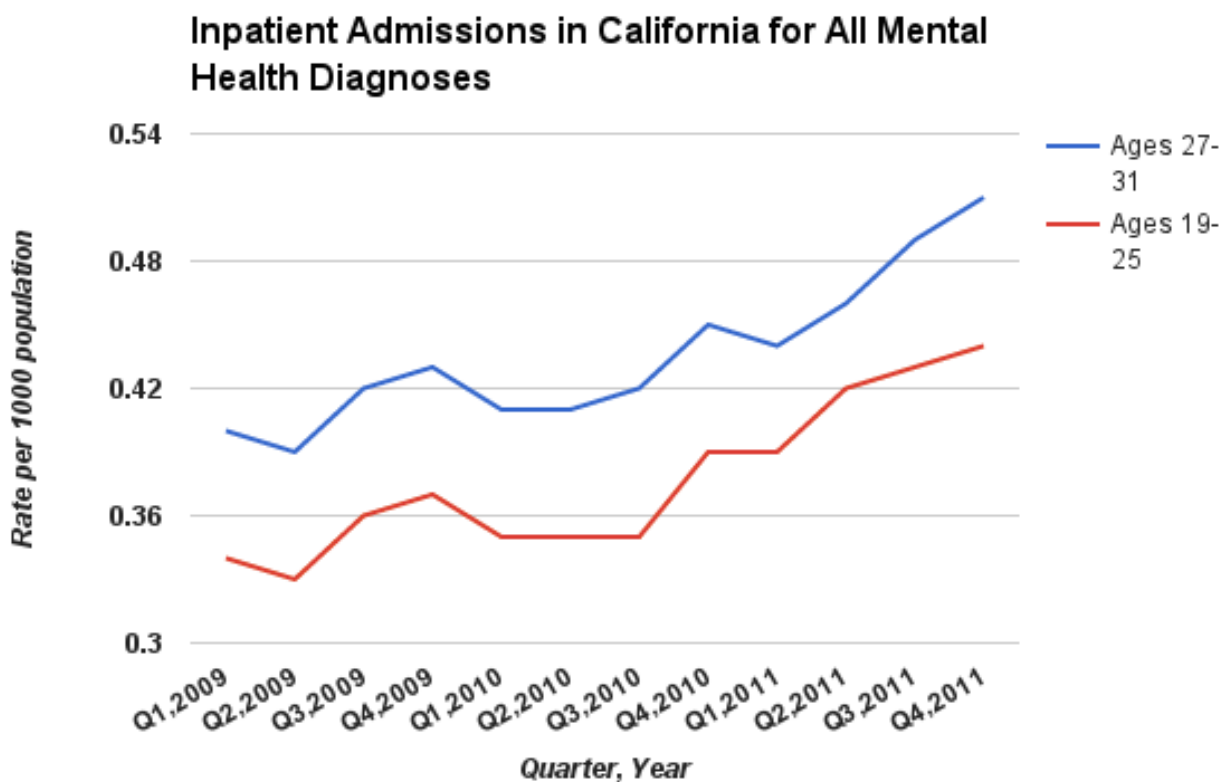
^aThis table represents the coefficient estimates for the 19 to 25 year-old age group interacted with an indicator for the enactment period (2nd and 3rd quarters, 2010), and the implement period (1st through 4th quarters, 2011) in regression models of share of ED visits that were covered by private insurance, controlling for age, sex, quarter, and where appropriate race. Values for p are based on two-tailed t statistics, and confidence intervals are based on robust Huber-White standard errors.

^b Coefficient estimates by race were calculated from the master data file filtering for a specific race and then running the same regression as stated above without controlling for race.

California Psychiatric Inpatient Admissions:

We first present visual trends of our main analysis looking at the differential rates of inpatient admissions between the treatment and control groups in Figure 2. The law was enacted during the second quarter of 2010, and the law was implemented during the fourth quarter of 2010. Trends in outcomes, as shown in Figure 2, for the treatment and control group were similar throughout the study period, validating the difference-in-difference research design. Currently the data for the post-PPACA arm only exists up to 2011, and therefore we were only able to analyze 4 quarters post-PPACA implementation, using the fourth quarter of 2010 as a wash-out period.

Figure 2. Quarterly Inpatient Admission Rates, 2009-2011^a



^a Quarterly inpatient admission rates. The Law was enacted Q2, 2010, and implemented Q4, 2010.

Table 4 reports sample means for the treatment and control groups throughout the entirety of the study period. Overall, the treatment group had lower rates of inpatient utilization for psychiatric reasons compared to the control group. Within each age-group and gender-group, blacks had the highest average rate of inpatient use, followed closely by whites. Native americans and asian/pacific islanders consistently had the lowest rates of inpatient use for psychiatric purposes. Males in both age groups, and among all races, had higher rates of inpatient use than females. Across both gender and age group, diagnoses of psychotic disorders made-up a majority of the inpatient admissions, and diagnoses of depression and substance use were closely matched.

Table 4. California Inpatient Psychiatric Admission Characteristics, 2009-2011

Characteristics	Ages 19-25			Ages 27-31		
	Full Sample	Males	Females	Full Sample	Males	Females
Admissions per 1,000 population^a	Rate(SD)	Rate(SD)	Rate(SD)	Rate(SD)	Rate(SD)	Rate(SD)
Race:						
All Races	0.38(0.31)	0.43(0.37)	0.29(0.26)	0.44(0.38)	0.52(0.41)	0.37(0.28)
White	0.47(0.21)	0.52(0.22)	0.42(0.23)	0.46(0.24)	0.48(0.26)	0.40(0.22)
Black	0.53(0.24)	0.58(0.26)	0.49(0.29)	0.68(0.33)	0.74(0.37)	0.61(0.32)
Hispanic	0.16(0.06)	0.18(0.09)	0.13(0.07)	0.17(0.08)	0.21(0.10)	0.15(0.08)
Asian/ Pacific Islander	0.06(0.02)	0.06(0.02)	0.06(0.03)	0.07(0.03)	0.08(0.03)	0.07(0.04)
Native American	0.06(0.03)	0.07(0.03)	0.05(0.03)	0.10(0.05)	0.14(0.08)	0.09(0.05)
Mixed/Other	0.16(0.07)	0.16(0.08)	0.15(0.08)	0.22(0.12)	0.22(0.13)	0.23(0.14)
Admissions with diagnosis(dx) of:						
Any psychiatric dx	0.38(0.31)	0.43(0.37)	0.29(0.26)	0.44(0.38)	0.52(0.41)	0.37(0.28)
Depression dx only^b	0.22(0.13)	0.18(0.15)	0.25(0.20)	0.26(0.15)	0.24(0.18)	0.30(0.21)
Substance use dx only	0.21(0.11)	0.24(0.23)	0.11(0.08)	0.25(0.13)	0.27(0.25)	0.15(0.11)
Psychosis dx only	0.58(0.43)	0.74(0.59)	0.45(0.32)	0.70(0.50)	0.88(0.76)	0.52(0.40)
Any other psychiatric dx	0.42(0.30)	0.40(0.29)	0.49(0.29)	0.49(0.31)	0.45(0.31)	0.58(0.33)
	N	N	N	N	N	N
Total Admissions	74,329	44,005	30,0324	57,619	33,794	23,825

^a Inpatient admission rates were calculated using age, sex, race and quarterly specific estimates from the US Census Bureau's state-level population estimates as the denominator. For each denominator, a specific age, sex, race and quarterly amount of inpatient admissions made up the corresponding numerator.

^b Any diagnosis category with "only", refers solely to that specific psychiatric diagnosis, it may include other physical diagnoses as well.

The overall rate of California psychiatric inpatient admissions rises over the extent of the three-year study period. As seen in Table 5, growth in inpatient admissions for all psychiatric diagnoses does not significantly change, during either the enactment or implementation period among 19 to 25 year-olds compared to 27 to 31 year-olds, 0.01 per 1,000 people ($p=0.14$). After stratification by gender, the differential change in inpatient admissions following the implementation of the young adult dependent provision increased statistically significantly for males ($\beta_1=0.01$, $p<0.001$), but not for females ($\beta_1=0.03$, $p=0.24$).

After stratification by race, the differential changes in inpatient admissions following the implementation of the young adult dependent provision in 19 to 25 year-olds compared to 27 to 31 year-olds was not equally mirrored by all racial groups. While 19 to 25 year-old whites ($\beta_1=0.01$, $p=0.05$), blacks ($\beta_1=0.01$, $p<0.001$), and mixed/other ($\beta_1=0.01$, $p<0.04$) racial groups saw significant increases in inpatient admission rates relative to the control group, hispanics ($\beta_1=-0.01$, $p=0.30$), asian/pacific Islanders ($\beta_1=-0.01$, $p=0.16$), and native americans ($\beta_1=0.01$, $p=0.15$) did not. No racial groups saw a significant differential change in inpatient admission rates during the enactment period.

Table 5. Differential Change in Inpatient Admissions With Mental Health Diagnoses per 1,000 Population for 19 to 25 Year-Olds Compared to 27 to 31 Year-Olds After Enactment of the Affordable Care Act Dependent Coverage Provision^a

	Enactment Effect, 2010 (Q2-Q3)			Implement Effect, 2011 (Q1-Q4)		
Outcome	Enactment Effect	95% CI	p	Implementation Effect	95% CI	p
All Psychiatric Admissions:	0.01	-0.01, 0.02	0.19	0.01	-0.01, 0.01	0.14
Admissions By Race^b:						
White	0.00	-0.01, 0.01	0.51	0.01	0.01, 0.02	0.05
Black	0.00	-0.01, 0.01	0.30	0.01	0.01, 0.01	<0.001
Hispanic	-0.01	-0.03, 0.01	0.37	-0.01	-0.03, -0.01	0.30
Asian/Pacific Islander	0.00	-0.02, 0.01	0.41	-0.01	-0.01, 0.01	0.16
Native American	0.00	-0.01, 0.01	0.70	0.01	0.00, 0.02	0.15
Mixed/Other	0.00	-0.01, 0.01	0.27	0.01	0.01, 0.02	0.04
Females:						
Female Admissions	0.00	-0.01, 0.00	0.29	0.03	-0.03, 0.11	0.24
Males:						
Male Admissions	0.00	-0.08, 0.07	0.99	0.01	0.01, 0.02	<0.001

^aThis table represents the coefficient estimates for the 19 to 25 year-old age group interacted with an indicator for the enactment period (2nd and 3rd quarters, 2010), and the implement period (1st through 4th quarters, 2011) in regression models of share of inpatient admissions rates controlling for age, sex, quarter, and where appropriate race. Values for p are based on two-tailed t statistics, and confidence intervals are based on robust Huber-White standard errors.

^bCoefficient estimates by race were calculated from the master data file filtering for a specific race and then running the same regression as stated above without controlling for race.

As seen in Table 6, there is no significant change in the differential proportion of inpatient admissions during the implementation period that were admitted through the ED ($\beta_1 = -0.01$, $p = 0.56$), among 19 to 25 year-olds compared to 27 to 31 year-olds. However, there was a statistically significant differential increase in the share of psychiatric inpatient admissions that did not come from the ED by 0.11 per 1,000 people ($p < 0.001$). When stratifying by race and

gender, there remains no statistically significant change in the number of inpatient admissions arising from the ED.

After stratification by gender, when looking at the differential change in the proportion of psychiatric inpatient admissions that did not come from the ED, a statistically significant increase was seen in females ($\beta_1=0.11$, $p<0.001$), but not for males ($\beta_1=0.00$, $p=0.35$). After stratification by race, a statistically significant differential increase in the proportion of psychiatric inpatient admissions that did not come from the ED was seen in whites ($\beta_1=0.10$, $p=0.02$), blacks ($\beta_1=0.02$, $p=0.04$), and mixed/others ($\beta_1=0.02$, $p=0.05$), but no statistically significant change was seen in hispanics ($\beta_1=0.00$, $p=0.66$), asian/pacific islanders ($\beta_1=-0.01$, $p=0.50$), and native americans ($\beta_1=0.01$, $p=0.19$).

Table 6. Differential Change in Likelihood that Inpatient Admissions with Behavioral Health Diagnoses for 19-25 Year Olds Compared to 27-31 Year Olds were Admitted Through the ED Versus Another Admitting Source, After Implementation of Dependent Coverage Provision^a

Outcome	Number of Admissions Through ED			Number of Admissions Not Through ED ^c		
	Implementation effect	95% CI	p	Implementation Effect	95% CI	p
All Psychiatric Admissions:	-0.01	-0.02, 0.01	0.56	0.11	0.10, 0.12	<0.001
Admissions By Race ^b :						
White	-0.01	-0.01, 0.01	0.47	0.12	0.09, 0.14	0.02
Black	0.01	0.00, 0.02	0.15	0.02	0.01, 0.05	0.04
Hispanic	-0.01	-0.01, 0.02	0.55	0.00	-0.01, 0.01	0.66
Asian/Pacific Islander	0.00	0.00, 0.02	0.20	-0.01	-0.01, 0.02	0.50
Native American	0.00	-0.02, 0.02	0.71	0.01	0.00, 0.02	0.19
Mixed/Other	0.00	-0.01, 0.01	0.26	0.02	0.01, 0.03	0.05
Females:						
Female Admissions	0.00	-0.01, 0.00	0.31	0.11	0.10, 0.13	<0.001
Males:						
Male Admissions	0.01	-0.01, 0.02	0.48	0.00	-0.02, 0.01	0.35
	N			N		
Total Number of Admissions by Source	37,134			98,743		

^aThis table represents the coefficient estimates for the 19 to 25 year-old age group interacted with an indicator for the implement period (1st through 4th quarters, 2011) in regression models of inpatient admissions, controlling for age, sex, quarter, and where appropriate race. Two separate regression models were run: one, with the dependent variable as the rate of psychiatric admissions that originated from the ED, and two, with the dependent variable as the rate of psychiatric admissions that did not originate from the ED. Values for p are based on two-tailed t statistics, and confidence intervals are based on robust Huber-White standard errors.

^b Coefficient estimates by race were calculated from the master data file filtering for a specific race and then running the same regression as stated above without controlling for race.

^c Admissions not through the ED include: transfers from another hospital, transfers from long-term care facility and skilled nursing facilities, court/law enforcement direct admissions, and outpatient physician referrals.

DISCUSSION

Following the young adult dependent provision implementation, the rates of emergency department visits that did not lead to admission were modestly less for young adults ages 19 to 25 compared to adults ages 27 to 31. When stratified by gender however, there was only a significant reduction in ED visits for females, but not for males. These findings are largely consistent with other studies (30, 32-33). Furthermore, following the implementation of this provision, young adults were less likely to be uninsured. However these reductions in ED visit rates, and the increase in the share of ED visits that were paid for by private insurance, were not equally felt by all racial groups. Notably, hispanics, and asian/pacific islanders were the only racial groups from the data who did not see significant differential reductions in ED visit rates following the implementation of the young adult dependent provision. Additionally, hispanics and asian/pacific islanders were the only racial groups who did not see significant differential increases in the share of ED visits that were paid for by private insurance following the implementation of the law.

While it has been previously shown in the literature [30] that nationally, inpatient psychiatric admissions for 19 to 25 year-olds compared to 27 to 31 year-olds increased following the young adult dependent provision, our study was not able to replicate this finding with a level of statistical significance using the California SID. However, after stratifying the data, certain 19 to 25 year-old subgroups were seen to have statistically significant increases in inpatient admissions relative to the 27 to 31 year-old age group following the implementation of the law, where other subgroups saw no changes. To the best of our knowledge, we are the first to show that while young adult males, whites, mixed/other, and blacks saw relative increases in psychiatric inpatient admissions; females, hispanics, asian/pacific islanders, and native americans saw no significant

changes.

This apparent disparity in inpatient admissions rates, was explored more by looking at if the source of inpatient admissions for each subgroup changed following the implementation of the law. What we found was that there was a statistically significant increase in the proportion of inpatient admissions that were not admitted through the ED, which aligns with results from a previous study looking at this overall effect [33]. These inpatient admissions not from the ED arise from sources such as: hospital to hospital transfers, transfers from long term care facilities and skilled nursing facilities, outpatient physician referrals, or law enforcement direct admissions. Ultimately, even after stratifying the data, there was no subgroup that saw any statistically significant changes in the share of inpatient admissions that arose from the ED.

Exploring this further, we can see that the same racial subgroups that saw statistically significant relative increases in inpatient admissions, also saw statistically significant increases in the share of their admissions that did not come through the ED. However, when stratifying the share of inpatient visits that were not admitted through the ED by gender, we see that while males saw statistically significant relative increases in inpatient admissions for psychiatric diagnoses, they do not see a statistically significant change in the share of visits coming from sources other than the ED, where females who saw no statistically significant relative change in inpatient admissions, saw a relative increase in the share of inpatient admissions that did not come from the ED. To the best of our knowledge this interaction of admission source and inpatient admission for psychiatric diagnoses following the young adult dependent provision has never been studied at the level of gender and race.

Ultimately, a discussion of the results from this study must be looked at holistically. For gender we see that while ED visits with psychiatric diagnoses decreased for females, they did not

statistically significantly change for males. Where inpatient admissions increased for males, but did not statistically significantly change for females. A possible explanation for this is that females are more likely than men to utilize outpatient services. It has been shown in the literature that overall females tend to present with more minor and nonfatal chronic diseases, where males tend to have more fatal chronic diseases; these differences can be found from early adolescence [46-48]. This may suggest physiologic gender-related predispositions to dangerous health problems, but it also suggests that females appear to be more willing to utilize health care at an earlier point in their disease process than males.

Therefore, it could be hypothesized that as young females and males made equal gains in health insurance coverage through the young adult dependent provision, females were more likely to utilize this newly acquired insurance to visit outpatient providers who could manage their psychiatric conditions effectively and prevent acute psychiatric conditions, which might necessitate ED visits. This could lead to the reduction in ED visits we saw by females, and could potentially explain the lack of change in ED visits we saw by males. Further, inpatient visits for males might have risen due to the lack of adequate outpatient care males received, leading to more acute psychiatric episodes that necessitate inpatient treatment.

Additionally, while we saw that the source of admission did not significantly change for males, females saw an increase in admissions not from the ED. We take this to represent that while females were no more likely before and after the young adult dependent provision was implemented to be admitted to the hospital for psychiatric purposes, the share of these admissions however were more likely to come from sources other than the ED. Adequate outpatient psychiatric care involves assessing one's patients for potentially dangerous and imminent acute psychiatric episodes that might be amenable to inpatient care, and this could

potentially explain the increase in the share of inpatient admissions for females that do not arise from the ED.

With these gender psychiatric health care utilization patterns in mind, we hypothesize that females are more likely to utilize and/or more effectively utilize outpatient care for psychiatric conditions following the implementation of the young adult dependent provision than males were. Ultimately, we can only predict that this gender difference in outpatient care utilization is what explains these apparent gender differences in psychiatric health care utilization, and therefore this gender difference should be explored further in the future by studying the effect of the young adult dependent provision on outpatient psychiatric care utilization by young adult males and females.

The racial disparities evident in our study must be explained in a different context than gender. One key difference from the racial subgroups, is that while both males and females had increases in the share of ED visits covered by private insurance, not all races saw these gains. Therefore, the previously detailed reasoning for gender must be altered for race.

While previous studies [36,41] have shown that whites appear to gain more private insurance coverage than non-whites, to the best of our knowledge no study has looked at the share of psychiatric ED visits covered by private insurance by race. We hypothesize that the differential increase in the share of ED visits covered by private insurance that was seen in whites, blacks, native americans, and mixed/others, but not seen in hispanics and asian/pacific islanders could be partially explained from the fact that their parents are less likely to be insured, and therefore these groups are less likely to gain insurance through this provision. Furthermore, according to a recent report on income, poverty, and health insurance status among all of these different races; hispanics and asians/pacific islanders have some of the lowest median household incomes of all

of the racial groups, and have some of the highest rates of uninsurance [48]. Clearly a disparity exists that is not being addressed by this young adult dependent provision. This can be hypothesized to be due to the high likelihood these young adults in the hispanic and asian/pacific islander racial subgroups are not able to gain access to insurance because their parents themselves do not have insurance. Furthermore, this could be due to differing enrollment rates in these racial subgroups, due to health literacy issues. While racial differences exist with regards to psychiatric health care utilization, our difference-in-differences approach which compares 19 to 25 year-old hispanics to 27 to 31 year-old hispanics, does not seek to compare these groups to each other with regards to the relative difference between racial groups; rather, we hoped to explore the difference within racial groups to assess if the young adult dependent provision was having an effect on each racial group, independently of the other racial groups.

We hypothesize that while these same racial group that saw a reduction in the rate of ED visits (whites, blacks, mixed/other, and native americans), and also saw an increase in the share of their psychiatric ED visits covered by private insurance, were more likely to utilize outpatient care more effectively or efficiently due to their new access to insurance coverage. Furthermore, whites, blacks, and mixed/other racial groups saw their source of admission statistically significantly increase from sources other than the ED, which mirrors that of females. However, while females did not see an increase in the rate of inpatient admissions, these same racial groups (whites, blacks, and mixed/other), did see increases in the rate of inpatient admissions. This difference in the reaction to the young adult dependent provision by females compared to these three racial groups needs to be explored further by looking at outpatient psychiatric health care utilization patterns.

There are some limitations to our study that must be addressed. While the California SEDD's

include any diagnosis the doctor entered for the patient, these diagnoses are not ranked. We therefore cannot ascertain from the data the primary diagnosis from a secondary or tertiary diagnosis. While a previous study has chosen to include patients' visits that had any psychiatric diagnosis provided [30], we chose to conservatively pick only patients who had a psychiatric diagnosis in the first diagnosis group column, out of the 25 possible diagnoses that could be given. Given that less than 5% of patients had more than 6 diagnoses listed, this did not represent a drastic change from how the previously mentioned study sampled their data. While this sampling method could bias towards under representing the amount of psychiatric ED visits in total, as long as it randomly samples between both age groups with no clear bias, which was tested and confirmed, then the difference-in-differences approach would still be just as representative of the data as a whole. Both methods ultimately yielded similar results; however, we thought it would be prudent to analyze the data in a way that could balance the potentially existing overrepresentation of psychiatric ED visits.

Another limitation of our study exists due to the fact that the California SID and SEDD employ "age masking" of observations to help prevent any of the data from potentially being identifiable. While we are not able to ascertain which cases are masked, the masking procedure for both the SID and SEDD was the same. However, the extent to which each database was masked differs [42]. For any given single year of age that was masked, that age was recoded into the midpoint age of the corresponding 5-year age group. The groups that are relevant to our study are 15-19, 20-24, 25-29, and 30-34. Therefore, a 20 year-old that is masked would be recoded as 22. While roughly 30% of the single-year of age data is masked for the SEDD, and roughly 50% of the single-year of age data is masked for the SID, less than 10% of individuals, after accounting for this masking, in each database are coded in the wrong age groups as we have

defined them (ages 19 to 25, and 27 to 31). For our analysis, this masking at worst would bias towards the null hypothesis of finding no differential effects of the young adult dependent provision due to the fact that some individuals in the 19 to 25 year-old group would be recoded into the 27 to 31 year-old group.

Underlying our entire study is this difference-in differences approach, which rests on the assumption that the control group will account for other time-varying factors that would have led the treatment group to experience different rates of medical care access and use after reform. Therefore, in the absence of the intervention (the young adult dependent provision), the treatment (19 to 25 year-olds) and the control groups (27 to 31 year-olds) would have experienced the same changes in outcomes. Some in the literature have argued that this assumption may be problematic when studying the impact of the PPACA dependent coverage provision on labor market-related outcomes such as employment status, and work hours since cyclical changes in the economy can have varying effects on different age groups. However, in our view, as well as others in the literature [34], given that health outcomes are less directly tied to cyclical fluctuations in the economy, our model is not necessarily susceptible to this infraction on the foundational assumption of the difference-in-differences approach.

While research has shown that recessions are associated with modest improvements in health and health behaviors [49-50], there is no clear evidence that these effects from economic cycles differentially impact different age groups of young adults. Additionally, recent studies [50-51] have shown that the countercyclical nature of health seen in prior recessions was not present during the Great Recession, the time period used for our main analyses. Ultimately, using relatively narrow age bandwidths of 19 to 25 years-old and 27 to 31 years-old should considerably reduce any differential effects that may exist.

Our study could not explore whether individuals were utilizing outpatient care or not. This is a major limitation of nearly every study that attempts to explore the effects of this young adult dependent provision, and this is a limitation that must be addressed. As we enter the era of electronic medical records, and large sweeping changes to the health care system take place, like the PPACA, we need a database that can track patients' health care utilization patterns. Not just ED and inpatient, but outpatient care as well. While there is a large concerted effort by many in public office to emphasize preventative medicine, there also needs to be a tool in place to assess how certain reforms are influencing outpatient care.

However with these limitations in mind, our study was able to explore a potential health care disparity in the earliest phases of the PPACA. As the PPACA gradually rolls out and data becomes available, we hope this study will highlight the importance of evaluating the PPACA's effects on differing races and genders. Our research shows the convoluted and mixed effects insurance coverage can have on psychiatric health care utilization, and we hope this study serves as a catalyst for further exploration into this important topic as the PPACA expands.

References

- [1] DeNavas-Walt C, et al. Income, poverty, and health insurance coverage in the United States: 2010; 2011. Washington.
- [2] Health Care Financing Administration. The Emergency Medical Treatment and Active Labor Act, as established under the Consolidated Omnibus Budget Reconciliation Act (COBRA) of 1985 (42 USC 1395 dd). Federal Register. 1994; 59:32086–127.
- [3] Fields WW, et al. The Emergency Medical Treatment and Labor Act as a federal health care safety net program. *Acad Emerg Med* 2001;8(11):1064–9.
- [4] Avalere. US Census Bureau:national and state population estimates forcommunity hospitals. <http://www.census.gov/popest/data/state/totals/2011/index.html>; 2011. [Accessed July 2011, 2011].
- [5] Lee MH, Schuur JD, Zink BJ. Owing t0068cbee cost of emergency medicine: beyond 2%. *Ann Emerg Med* 2013;62(5):498–505.e493.
- [6] Downey LVA, Zun LS, Gonzales SJ. Utilization of emergency department by psychiatric patients. *Prim Psychiatry*. 2009; 16:60–64.
- [7] Norquist GS, Regier DA. The epidemiology of psychiatric disorders and the de facto mental health care system. *Annu Rev Med*. 1996; 47:473–9.
- [8]IOM Committee on the Future of Emergency Care in the United States Health System. Hospital-Based Emergency Care at the Breaking Point. Washington, DC: National Academies Press, 2007.
- [9] Larkin GL, Claassen CA, Emond JA, Pelletier AJ, Camargo CA Jr. Trends in U.S. emergency department visits for mental health conditions,1992 to 2001. *Psychiatr Serv*. 2005; 56:671–7.

- [10] Larkin, G. L. et al. Mental health and emergency medicine: a research agenda. *Academic emergency medicine : official journal of the Society for Academic Emergency Medicine* 16, 1110–9 (2009).
- [11] Busch SH, Meara E, Huskamp HA, Barry CL. Characteristics of adults with substance use disorders expected to be eligible for Medicaid under the ACA. *Psychiatr Serv.* 2013;64(6) 520-526.
- [12] Garfield RL, Zuvekas SH, Lave JR, Donohue JM. The impact of national health care reform on adults with severe mental disorders. *Am J Psychiatry.* 2011;168(5):486-494.
- [13] Kessler RC, Chiu WT, Demler O, Merikangas KR, Walters EE. Prevalence, severity, and comorbidity of 12-month DSM-IV disorders in the National Comorbidity Survey Replication [published correction appears in *Arch Gen Psychiatry.* 2005;62(6):709]. *Arch Gen Psychiatry.* 2005;62(6):617-627.
- [14] Kessler RC, Chiu WT, Colpe L, et al. The prevalence and correlates of serious mental illness (SMI) in the National Comorbidity Survey Replication (NCS-R). In: Manderscheid RW, Berry JT, eds. *Mental Health, United States, 2004.* Rockville, MD: Substance Abuse and Mental Health Services Administration; 2006:134-148.
- [15] Sommers, B. D. & Kronick, R. The Affordable Care Act and insurance coverage for young adults. *JAMA : the journal of the American Medical Association* 307, 913–4 (2012).
- [16] Sommers, B. D., Buchmueller, T., Decker, S. L., Carey, C. & Kronick, R. The Affordable Care Act has led to significant gains in health insurance and access to care for young adults. *Health affairs (Project Hope)* 32, 165–74 (2013).
- [17] Mulcahy, A. et al. Insurance coverage of emergency care for young adults under health reform. *The New England journal of medicine* 368, 2105–12 (2013).

- [18] Chua, K.-P. P. & Sommers, B. D. Changes in health and medical spending among young adults under health reform. *JAMA : the journal of the American Medical Association* 311, 2437–9 (2014).
- [19] Blumenthal, D. & Collins, S. R. Health care coverage under the Affordable Care Act--a progress report. *The New England journal of medicine* 371, 275–81 (2014).
- [20] Sommers BD. Number of young adults gaining insurance due to the Affordable Care Act now tops 3 million. Washington, DC: Assistant Secretary for Planning and Education, Department of Health and Human Services, June 2012 (<http://aspe.hhs.gov/aspe/gaininginsurance/rb.shtml>).
- [21] Collins SR, Blumenthal D, Garber T. New U.S. Census data on the uninsured underscores need for expanded coverage. New York: The Commonwealth Fund Blog, September 2013 (<http://www.commonwealthfund.org/publications/blog/2013/sep/new-us-census-data-on-the-uninsured>).
- [22] Collins SR, Rasmussen PW, Garber T, Doty MM. Covering young adults under the Affordable Care Act: the importance of outreach and Medicaid expansion. New York: The Commonwealth Fund, August 2013 ([http://www.commonwealthfund.org/~media/Files/Publications/Issue%20Brief/2013/Aug/1701_Collins covering_young_adults_tracking_brief_final_v4.pdf](http://www.commonwealthfund.org/~media/Files/Publications/Issue%20Brief/2013/Aug/1701_Collins_covering_young_adults_tracking_brief_final_v4.pdf)).
- [23] Finkelstein, A., S. Taubman, B. Wright, M. Bernstein, J. Gruber, J. P. Newhouse, H. Allen, and K. Baicker (2012). “The Oregon Health Insurance Experiment: Evidence from the First Year.” *The Quarterly Journal of Economics* 127(3):1057-1106.

- [24] Card, D., C. Dobkin, and N. Maestas. (2008). “The Impact of Nearly Universal Insurance Coverage on Health Care Utilization and Health: Evidence from Medicare.” *American Economic Review* 98(5): 2242-2258.
- [25] Kolstad, J. T., and A. E. Kowalski (2012). “The impact of health care reform on hospital and preventive care: evidence from Massachusetts.” *Journal of Public Economics* 96(11): 909-929.
- [26] Miller S: The effect of insurance on emergency room visits: an analysis of the 2006 Massachusetts health reform. *J Public Econ* 2012; 96:893–908
- [27] Anderson, M., C. Dobkin, and T. Gross (2012). “The Effect of Health Insurance Coverage on the Use of Medical Services.” *American Economic Journal: Economic Policy* 4(1): 1-27.
- [28] Anderson, M. L., C. Dobkin, and T. Gross (2013). “The Effect of Health Insurance on Emergency Department Visits: Evidence from an Age-Based Eligibility Threshold.” *Review of Economics and Statistics*, forthcoming.
- [29] Hernandez-Boussard, T., Burns, C. S., Wang, N. E., Baker, L. C. & Goldstein, B. A. The affordable care act reduces emergency department use by young adults: evidence from three States. *Health affairs (Project Hope)* 33, 1648–54 (2014)
- [30] Golberstein, E., Busch, S. H., Zaha, R., Greenfield, S.F., Beardslee, W.R., Meara, E. Effect of the Affordable Care Act’s Young Adult Insurance Expansions on Hospital-Based Mental Health Care. *Am J Psychiatry* AiA:1–8
- [31] Saloner, B. & Lê Cook, B. An ACA provision increased treatment for young adults with possible mental illnesses relative to comparison group. *Health affairs (Project Hope)* 33, 1425–34 (2014).

- [32] Akosa A., Yaa, Moriya, A., and Simon, K.(2013). Effects of Federal Policy to Insure Young Adults: Evidence from the 2010 Affordable Care Act Dependent Coverage Mandate. *American Economic Journal: Economic Policy*, 5, 1-28.
- [33] Akosa A., Yaa, M., Asako, and Simon, K., (2014). Access to Health Insurance and the Use of Inpatient Medical Care: Evidence from the Affordable Care Act Young Adult Mandate. Working paper, Indiana University.
- [34] Barbaresco, S., Courtemanche, C., Qi, Y., (2014) Impacts of the Affordable Care Act Dependent Coverage Provision on Health-Related Outcomes of Young Adults. George State University.
- [35] Meara, E. et al. Use of hospital-based services among young adults with behavioral health diagnoses before and after health insurance expansions. *JAMA psychiatry* 71, 404–11 (2014).
- [36] O’Hara, B. & Brault, M. W. The disparate impact of the ACA-dependent expansion across population subgroups. *Health services research* 48, 1581–92 (2013).
- [37] Sommers, B. D. & Kronick, R. The Affordable Care Act and insurance coverage for young adults. *JAMA : the journal of the American Medical Association* 307, 913–4 (2012).
- [38] Monheit, A., Cantor, J., Delia, D. and Belloff, D. (2011). How Have State Policies to Expand Dependent Coverage Affected the Health Insurance Status of Young Adults? *Health Services Research*, 46, 251-67.
- [39] Levine, P. B., McKnight R., and Heep S. (2011). How Effective are Public Policies to Increase Health Insurance Coverage among Young Adults? *American Economic Journal: Economic Policy*, 3 (1): 129-56.

- [40] Taubman, S. L., Allen, H. L., Wright, B. J., Baicker, K. & Finkelstein, A. N. Medicaid increases emergency-department use: evidence from Oregon's Health Insurance Experiment. *Science* 343, 263–8 (2014).
- [41] Sommers, B. D., Buchmueller, T., Decker, S. L., Carey, C. & Kronick, R. The Affordable Care Act has led to significant gains in health insurance and access to care for young adults. *Health Aff (Millwood)* 32, 165–74 (2013).
- [42] Agency for Health care Research and Quality, Healthcare Cost and Utilization Project. Overview of the State Inpatient Databases (SID) [Internet]. Rockville (MD): AHRQ; Available from: <http://www.hcup-us.ahrq.gov/sidoverview.jsp>
- [43] Agency for Healthcare Research and Quality, Healthcare Cost and Utilization Project. Overview of the State Emergency Department Databases (SEDD) [Internet]. Rockville (MD): AHRQ; Available from: <http://www.hcup-us.ahrq.gov/seddooverview.jsp>
- [44] <http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml>
- [45] Carmen, D., Proctor, BD & Smith, JC. Current Population Reports, P60-235, Income, Poverty, and Health Insurance Coverage in the United States: 2007. (2008). at <<http://health-equity.pitt.edu/1073/>>
- [46] Sweeting, H. Reversals of fortune? Sex differences in health in childhood and adolescence. *Social science & medicine* (1995). doi:10.1016/0277-9536(94)E0059-2
- [47] Lahelma, E, Martikainen, P & Rahkonen, O. Gender differences in illhealth in Finland: patterns, magnitude and change. *Social science & ...* (1999). at <<http://www.sciencedirect.com/science/article/pii/S0277953698002858>>

[48] Wingard, D. L., Cohn, B. A., Kaplan, G. A., Cirillo, P. M., & Cohen, R. D. (1989). Sex differentials in morbidity and mortality risks examined by age and cause in the same cohort. *American Journal of Epidemiology*, 130(3), 601–610.

[49] Ruhm, C. J., (2003). *Healthy Living In Hard Times*. National Bureau of Economic Research Working Paper #9468.

[50] Ruhm, C. J. (2013). *Recessions, Healthy No More?*. University of Virginia and National Bureau of Economic Research Working Paper.

[51] Tekin, E., McClellan, C., and Minyard, K.J. (2013). *Health and Health Behaviors during the Worst of Times: Evidence from the Great Recession*. National Bureau of Economic Research Working Paper #19234.

APPENDIX

Table S1. ICD-9 Codes For ED Visits and Inpatient Admissions and Birth Exclusions

Visit/Admission Diagnosis	ICD-9 Code
Any Psychiatric Diagnosis	All codes between 290.XX to 319.XX
Substance Use Disorder (SUD) only	292.XX, 303.XX, 304.XX, 305.XX AND
Depression only	296.2, 296.3, 300.4, 311.XX,
Psychoses only	293.81 and 293.82, 294.2X- 294.9X, 295.XX, 297.XX, 298.XX, 296.8 and 296.9
Any Other Psychiatric Diagnosis	Any remaining ICD9 code between 290.XX to 319.XX not included in the De- pression, SUD, or Psychoses categories
Codes used to exclude birth related discharges	V22-V24, V27-V39