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### Wellbeing and Marriage: Does Marriage Improve Mental Health?

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## Wellbeing and Marriage: Does Marriage Improve Mental Health?

### Abstract

With the decline in marriage rates and the rise in mental health issues, understanding the potential correlation between marital status and overall mental health is of economic importance. This research explores the potential effects of marital status on mental health in the U.S., using microdata from the 2016 Behavior Risk Factor Surveillance System. The role of marital status is examined on three different dependent variables. My results suggest that marriage is associated with a decrease in number of days of poor mental health, a decrease in the likelihood of a depressive disorder diagnosis, and an increase in overall life satisfaction.

### Cover Page Footnote

I would like to express my deep gratitude to Dr. Dirk Early and Dr. Katie Grooms, my research supervisors, for their patient guidance, enthusiastic encouragement, and useful critiques of this research work.

## ***Introduction***

The number of Americans suffering from mental illness is significantly higher than in previous eras, with about one in five individuals considered to be living with a “diagnosable mental, behavioral, or emotional disorder.” (NIMH n.d.). Not only do mental illnesses affect an individual’s health and wellbeing, but they also impose costs on society, as these workers tend to be less productive and consume more resources (Bubonya et al. 2017). With the decline in marriage rates and the rise in mental health issues, economists find exploring a potential correlation between marital status and overall mental health to be of economic importance. The majority of the literature exploring this relationship focuses on the effect of marital status on a self-rated proxy for mental health, such as life satisfaction, happiness, or overall psychological health. However, most of the surrounding literature focuses on specific subgroups, looking exclusively at a certain age range or gender (Adamczyk 2017; Grundy and Sloggett 2003; Le Strat et al. 2011; Williams et al. 2008).

This research is similar to Chapman and Guven (2016), who use survey data from the U.S., UK, and Germany to find that the effect of marital status on happiness is significant and should be controlled for when estimating the effect of employment (and other measures) on happiness. Though utilizing similar survey data for the U.S., the following employs marital status as the variable of interest and explores multiple outcome variables that proxy for mental wellbeing. This paper seeks to explore to what extent, if any, marital status in the United States can affect an individual’s mental health *ceteris paribus*.

Using data from the Behavioral Risk Surveillance System 2016 survey, three separate regression analyses were performed to test the potential effects of marital status on an individual’s mental health. With two of the regressions, there is significant evidence that being married decreases the likelihood of mental health issues, while being separated from a spouse is associated with a significant increase in the likelihood of poor mental health. A number of differential effects using regression interactions with marital status and age, marital status and gender, and marital status and race are also analyzed. The findings from all three regressions support the literature that marriage is associated with stronger mental health. Additionally, this paper compares the results from the different outcome variables: self-reported number of days mental health “not good” in last thirty days, ever diagnosed with a depressive disorder, and satisfied/very satisfied with life. This research has policy implications. For example, if marital status is linked to mental health, then schools should consider mandating healthy relationship education in conjunction with programs such as sexual education.

### *Literature Review*

This paper builds upon the surrounding literature on marriage and mental health. To develop a comprehensive foundation, previous research pertaining to each of these respective areas is surveyed. Then, more specific literature, which addresses the connections between marital status and mental health, is reviewed in hopes of observing an outcome that extends current understanding of the effects of marital status on mental health measures.

Marriage has long been of interest to economists because of the social, monetary, and medical implications it has for the average individual. Previous research has emphasized the different effects of marriage between men and women. Bursztyn et al. (2017) find that, even in the 21<sup>st</sup>-century, there are different “ideals” for men and women that wish to marry. Even though women are now heavily involved in the workplace, women that want to marry face a tradeoff that men do not: ambition in the labor market has a negative effect on female desirability in the dating market (Bursztyn et al.). Of those that choose to marry, Ross et al. (1990) find that marriage protects men from death more than women, and generally benefits men more than women in other aspects such as physical health. However, the added social support, economic support, and generally healthier lifestyles associated with marriage benefit, at least to some extent, both genders (Ross et al.). In addition, while it is a commonly held belief that the division of labor in a household contributes to a male marriage premium, Reed and Hartford (1989) reject marriage as a way of securing gains from specialization. They argue instead that the added household costs make married men work longer hours and more difficult jobs to offset these costs (Reed and Hartford).

Fu and Noguchi (2016) analyze marriage and happiness and note that, while there is a distinct positive correlation between happiness and marital status, age significantly impacts the effect of marriage on happiness. They assert that older couples tend to more strongly associate marriage with happiness (Fu and Noguchi). Fu and Noguchi additionally find that the happiness gap between higher and lower-balanced married couples was significant, with more educated couples being happier than couples with less education.

Previous research has addressed the rise of mental health issues and sought to quantify the resulting economic losses. Bubonya et al. (2017) find that work absences are roughly five percent higher among workers who report being in poor mental health, and productivity was lower for these workers even when they were in attendance. Of workers that are able to remain in the workforce with a mental illness, Marcotte and Wilcox-Gok (2003) find that earnings losses due to mental illnesses are far greater at the lower tail of the earnings distribution.

Other studies emphasize the externalities associated with mental illnesses. Frank and McGuire (1999) argue that these illnesses are correlated with costly social problems, such as crime, unemployment, homelessness, and violence. De Oliveira et al. (2016) seek to quantify such externalities. Their estimates suggest that mental disorders cost Ontario \$2.1 billion in 2012; the main cost drivers were psychiatric hospitalizations and long-term care (de Oliveira et al.). In terms of demographics, costs were slightly higher for women than men, and costs were the highest for patients 65 and older (de Oliveira et al.).

A number of studies find that mental illnesses can contribute to other costly behaviors. Dahal and Fertig (2013) examine the impact of mental illness on spending behavior. Individuals that have mental health issues were found to spend more on goods and services with instant gratification, instead of planning for future investments (Dahal and Fertig). Dahal and Fertig highlight a worrisome long-term costs of mental illness: both single and married women with mental health issues reduced spending on education. Education is often correlated with increased productivity and lifetime success. Therefore, reducing spending on one's education is particularly troubling.

Extensive literature addresses both marital status and mental health. While this causal relationship has not been studied as much as general correlations between happiness and marriage, and therefore marriage and positive mental health, the relationship between the two is important to economists. If we assume that individuals are rational, then individuals would only marry if a marriage helped them achieve a more optimal status. A positive causal relationship between marital status and mental health could explain some of the success of happily married couples, while the converse could explain mental health issues such as depression for spouses that are less than satisfied in their marriages.

While it proves difficult to quantify happiness and measures of mental health, numerous studies have surveyed individuals and asked them about marital satisfaction and overall levels of happiness, as well as their state of mental health. In a study that compiled datasets across the U.S., the UK, and Germany, Chapman and Guven (2016) find that when comparing the health of married individuals, how individuals self-rated their marriage, as either "not happily married, pretty happily married, or very happily married," had a significant effect on their stated levels of health, including mental health measures such as depression, trust, and overall subjective health. For individuals over 65, Grundy and Sloggett (2003) attribute the comparatively stronger mental wellbeing of married individuals to the added social support that married couples receive. This social support has a significant effect on an individual's self-rated psychological health (Grundy and Sloggett).

Adamczyk (2017) researches a similar issue, finding that Polish young adults aged 20 to 35 who revealed higher satisfaction with relationship status predicted higher life satisfaction, higher emotional and psychological well-being, and lower depressive symptoms after controlling for gender, age, and education. Le Strat et al. (2011) also address the correlation of age with marital well-being, interviewing U.S. women over age 45 that married before they were 18. This research finds that over the course of their lifetime, women who married as children (before 18) had greater rates of psychiatric disorders, compared with women who married as adults (Le Strat et al.).

Previous literature also analyzes older individuals who have lost a spouse or who have a spouse in poor health, nearing death. Williams et al. (2008) notes that the transition from married to unmarried is associated with declines in overall mental health, even more significant than widowed, never married, or divorced individuals. As individuals age, generally the significance of the marital relationship increases; however, spouses of older adults with declining health may experience decreasing social and emotional benefits from the marital relationship. The quality of the marital relationship can therefore be diminished, impacting the “subjective well-being of the otherwise healthy partner and compromising physical and mental outcomes” (Williams et al.).

Other studies explore the converse: that mental health strongly affects the likelihood of marriage. Breslau et al. (2008) provide evidence from a large multinational sample that suggests that mental disorders contribute to decreasing marriage both by reducing the probability of becoming married and by increasing the probability of divorce among people who choose to marry. Among mental health disorders, specific phobia, major depression, and alcohol abuse are largely associated with both a reduction in marriage and increase in divorce (Breslau et al.). Similarly, Reichman et al. (2013) note that specific types of relatively prevalent mental illness reduce the probability the couples are married by 22-24%, along with the probability that they are living together (married or cohabiting) by 24-26% three years after having any children.

It is also important to note that marriage and mental health are both culturally dependent issues (Vanassche et al. 2013). Therefore, results can be expected to differ globally, since the more marriage is valued within a society, the greater the influence of marital status on subjective well-being will have (Vanassche et al.). Additionally, it may be difficult to quantify “spillover” effects of mental health between partners. Fletcher (2009) asserts that the mental health of one partner may have a greater influence on the other partner’s mental health status than his or her own mental health endowment.

While this paper builds upon previous literature that explores the interaction of marital status with both wellbeing and self-reported measures of mental health, it is evident that previous studies are limited by a focus on specific subgroups and smaller datasets. By taking a nationwide macro approach, this research hopes to spur more extensive study of marriage and its effects on specific mental illnesses.

### *Data*

The data used was collected by the Behavioral Risk Factor Surveillance System (BRFSS). The BRFSS, administered and supported by CDC's Behavioral Risk Factor Surveillance Branch, is an ongoing data collection program designed to measure behavioral risk factors for the adult population (18 and over). The data include observations from all 50 U.S. states, Washington DC, and 3 U.S. territories on U.S. residents and their health-related risk behavior, chronic health conditions, and use of preventative services. This dataset offers 275 variables, but only those that relate to marital status or mental health are included, as well as control variables that likely correlate with marital status and affect mental health. Other independent variables that may not correlate with marital status, but likely have a significant impact on an individual's mental health are also included. Table 1 describes the 39 variables represented in the data. The italicized variables represent the three different outcome variables, *menthlth*, *depressive disorder*, and *satisfied*, which measure or proxy for mental health.

**Table 1: Variable Definition**

Variable	Description
<i>menthlth</i>	Number of days respondent mental health not good in the last 30 days (0-30)
<i>depressive disorder</i>	Dummy variable. If respondent has ever been diagnosed with depressive disorder=1
<i>satisfied</i>	Dummy variable. If respondent is either satisfied or very satisfied with life=1
married	Dummy variable. If respondent is married=1
divorced	Dummy variable. If respondent is divorced=1
widowed	Dummy variable. If respondent is widowed=1
separated	Dummy variable. If respondent is separated=1
unmarried couple	Dummy variable. If respondent is part of unmarried couple=1
female	Dummy variable. If respondent is female=1
married female	Interaction. If respondent is female and married=1
divorced female	Interaction. If respondent is female and divorced=1
widowed female	Interaction. If respondent is female and widowed=1
separated female	Interaction. If respondent is female and separated=1
unmarried female	Interaction. If respondent is female and part of unmarried couple=1
nonwhite	Dummy variable. If respondent is any race other than white=1
nonwhite married	Interaction. If respondent is nonwhite and married=1

nonwhite divorced	Interaction. If respondent is nonwhite and divorced=1
nonwhite widowed	Interaction. If respondent is nonwhite and widowed=1
nonwhite separated	Interaction. If respondent is nonwhite and separated=1
nonwhite unmarried	Interaction. If respondent is nonwhite and part of unmarried couple=1
age 18 to 29	Dummy variable. If respondent is 18-29=1
age 30 to 49	Dummy variable. If respondent is 30-49=1
age 70 and up	Dummy variable. If respondent is 70+ = 1
married and age 18 to 29	Interaction. If respondent is 18-29 and married=1
divorced and age 18 to 29	Interaction. If respondent is 18-29 and divorced=1
widowed and age 18 to 29	Interaction. If respondent is 18-29 and widowed=1
separated and age 18 to 29	Interaction. If respondent is 18-29 and separated= 1
unmarried and age 18 to 29	Interaction. If respondent is 18-29 and part of unmarried couple=1
married and age 30 to 49	Interaction. If respondent is 30-49 and married=1
divorced and age 30 to 49	Interaction. If respondent is 30-49 and divorced=1
widowed and age 30 to 49	Interaction. If respondent is 30-49 and widowed=1
separated and age 30 to 49	Interaction. If respondent is 30-49 and separated= 1
unmarried and age 30 to 49	Interaction. If respondent is 30-49 and part of unmarried couple=1
married and age 70 and up	Interaction. If respondent is 70+ and married=1
divorced and age 70 and up	Interaction. If respondent is 70+ and divorced=1
widowed and age 70 and up	Interaction. If respondent is 70+ and widowed=1
separated and age 70 and up	Interaction. If respondent is 70+ and separated= 1
unmarried and age 70 and up	Interaction. If respondent is 70+ and part of unmarried couple=1
physlth	Number of days respondent physical health not good in the last 30 days (0-30)
caregiver	Dummy variable. If respondent provided regular health care to family/friend with health issues in last 30 days=1
smoking	Dummy variable. If respondent currently smokes=1
hvydrinking	Dummy variable. If respondent heavily drinks (men more than 14, women more than 7 drinks per week)=1
vet	Dummy variable. If respondent has ever been in the military=1
children	Number of children that respondent has
exercise	Dummy variable. If respondent participated in any physical activity in the last month=1
notgrad	Dummy variable. If respondent did not graduate from high school=1
hsgrad	Dummy variable. If respondent's highest education level is hs degree=1
some college	Dummy variable. If respondent attended some college=1
poorest	Dummy variable. If respondent's household earned less than \$15,000 in the last year=1
poor	Dummy variable. If respondent's household earned more than \$15,000 but less than \$25,000=1
higher income	Dummy variable. If respondent's household earned more than \$35,000 but less than \$50,000=1
highest income	Dummy variable. If respondent's household earned more than \$50,000 in the last year=1



While the BRFFS obtained 486,303 total observations for 2016, some variables have fewer observations because either respondents left questions unanswered or interviewers did not ask a certain question. Each BRFFS questionnaire includes a core section, which every interviewer is required to complete, and an optional section, which is asked in alternating years by different states. The variables *satisfied* and *caregiver* have far fewer observations because these variables were coded from optional modules.

**Table 2: Summary of Important Variables**

*Uninteracted Terms*

Variable	Mean	Std. Dev.	Min	Max
<b>days mental health "not good"</b>	3.429	7.732	0	30
<b>depressive disorder</b>	0.177	0.382	0	1
<b>satisfied</b>	0.949	0.220	0	1
married	0.532	0.499	0	1
divorced	0.137	0.344	0	1
widowed	0.124	0.329	0	1
separated	0.020	0.141	0	1
unmarried couple	0.032	0.174	0	1
female	0.567	0.495	0	1
nonwhite	0.217	0.412	0	1
age 18 to 29	0.103	0.303	0	1
age 30 to 49	0.236	0.425	0	1
age 70 and up	0.235	0.424	0	1
physical health	4.351	8.882	0	30
caregiver	0.033	0.178	0	1
smoking	0.146	0.353	0	1
hvydrinking	0.060	0.238	0	1
veteran	0.132	0.338	0	1
children	0.503	1.019	0	23
exercise	0.751	0.432	0	1
some college	0.277	0.448	0	1
highest income	0.418	0.493	0	1

*Interacted Terms*

married female	0.282	0.450	0	1
divorced female	0.083	0.276	0	1
widowed female	0.098	0.297	0	1
separated female	0.012	0.110	0	1
unmarried female	0.017	0.128	0	1
married and age 18 to 29	0.022	0.145	0	1
divorced and age 18 to 29	0.002	0.046	0	1
widowed and age 18 to 29	0.001	0.013	0	1
separated and age 18 to 29	0.001	0.036	0	1
unmarried and age 18 to 29	0.010	0.098	0	1
married and age 30 to 49	0.145	0.352	0	1
divorced and age 30 to 49	0.028	0.166	0	1
widowed and age 30 to 49	0.002	0.049	0	1
separated and age 30 to 49	0.008	0.088	0	1
unmarried and age 30 to 49	0.012	0.108	0	1
married and age 70 and up	0.107	0.309	0	1
divorced and age 70 and up	0.029	0.168	0	1
widowed and age 70 and up	0.086	0.281	0	1
separated and age 70 and up	0.002	0.044	0	1
unmarried and age 70 and up	0.002	0.040	0	1
married nonwhite	0.091	0.288	0	1
divorced nonwhite	0.030	0.172	0	1
widowed nonwhite	0.019	0.138	0	1
separated nonwhite	0.009	0.095	0	1
unmarried nonwhite	0.010	0.101	0	1

Multiple dummy variables were created to allow for the representation of categorical data. For each variable, a value of “1” indicates the presence of that descriptor in a specific observation. Because multiple (0, 1) dummies are coded, the variation and minimum/maximum of each variable are difficult to reasonably interpret. Dummy variables for marital status, age, white/nonwhite, physical health, smoking, heavy drinking, kids, and a number of other control variables were included. Age was divided into four categories to explore if the effects of marital status on mental health were stronger for the youngest age group (marrying earlier than the U.S. national average). The data for respondent races was simplified by recoding these variables. Any race other than white was recorded as “1” to test the differences between whites and all minorities as a whole.

To highlight the data of respondents, 53% of the respondents were married, 57% were female, 22% were nonwhite, and 24% of respondents were between the ages of 30 and 49. The most common educational background of respondents was some college with around 28%, and the most common family income was over \$50,000 for the respondent’s household with around 42%. Additionally, 15% of respondents labeled themselves as current smokers, while the average number of days of physical health “not good” out of the last 30 was around 4 days.

Because much of the literature surrounding marital status and mental health focuses on a particular subgroup, such as age or gender, 25 interaction variables (Adamczyk 2017; Grundy and Sloggett 2003; Le Strat et al. 2011; Williams et al. 2008) were created. These interaction terms were created between gender and marital status and between age and marital status, following prominent literature, which acknowledges that the effect of marital status on mental health may differ by both gender and age. Additionally, interaction terms between race and marital status were created to account for the likelihood that the effect of marital status on mental health may be different for minorities than for the white majority in the sample.

Because mental health is difficult to quantify, three dependent variables that could potentially measure or proxy for mental health were included. *Menthlth* was coded for the number of days a respondent self-reported their mental health as “not good” out of the last 30 days, while *depressive disorder* measured respondents that obtained an official diagnosis for a potential mental illness. The dummy variable *satisfied* was created as a weaker proxy for mental illness, assuming that those individuals who reported being “very satisfied” or “satisfied” were unlikely to have any significant mental health issues. The average number of days of mental health “not good” in the last 30 days was around 3 days, around 18% were diagnosed with a depressive disorder, and 95% reported that they were either “very satisfied” or “satisfied” with their lives.

### **Methodology**

First, an OLS model is used to estimate the effect of marital status on *number of days mental health “not good” in the last 30*. With the range of 0-30 days for days mental health “not good,” this technique models the approximately continuous nature of the dependent variable (0 to 30 scale).

Then, two Logits are used for both the binary dependent variables *depressive disorder* and *satisfied*. This technique is preferable to a Linear Probability Model because Logits bound the dependent variable between (0, 1), and the relationship between the dependent and independent variables is not assumed to be constant.

All three outcome variables are modeled with the same independent variables; the only difference in regressions is that the outcome variable changes. The determinants of an individual’s mental health, shown through *number of days mental health “not good,” depressive disorder, and satisfied*, can be decomposed into demographic factors (such as age, gender, and race), personal characteristics (such as marital status, education, and number of children), and addictive habits (such as exercise, smoking, and drinking).

Dummy variables are created to allow for the representation of categorical data. To control for the variation in the effect of marital status on mental health across gender, race, and age, 25 interaction variables are included between marital status and gender, marital status and race, and marital status and age. The three regressions follow this form:

$$\begin{aligned}
 (\mathit{menthlth}, \mathit{depressive\ disorder}, \mathit{and\ satisfied}) = & \beta_0 + \beta_1 \mathit{married} + \beta_2 \mathit{divorced} + \\
 & \beta_3 \mathit{separated} + \beta_4 \mathit{widowed} + \beta_5 \mathit{unmarried\_couple} + \beta_6 \mathit{female} + \beta_7 \mathit{femmar} + \beta_8 \mathit{femdiv} + \\
 & \beta_9 \mathit{femwid} + \beta_{10} \mathit{femsep} + \beta_{11} \mathit{femunmar} + \beta_{12} \mathit{nonwhite} + \beta_{13} \mathit{nonwhitemar} + \\
 & \beta_{14} \mathit{nonwhitediv} + \beta_{15} \mathit{nonwhitewid} + \beta_{16} \mathit{nonwhitesep} + \beta_{17} \mathit{nonwhiteunmar} + \\
 & \beta_{18} \mathit{age\_18to29} + \beta_{19} \mathit{age\_30to49} + \beta_{20} \mathit{age\_70andup} + \beta_{21} \mathit{age\_18to29mar} + \\
 & \beta_{22} \mathit{age\_18to29div} + \beta_{23} \mathit{age\_18to29wid} + \beta_{24} \mathit{age\_18to29sep} + \\
 & \beta_{25} \mathit{age\_18to29unmarried} + \beta_{26} \mathit{age\_30to49mar} + \beta_{27} \mathit{age\_30to49div} + \\
 & \beta_{28} \mathit{age\_30to49wid} + \beta_{29} \mathit{age\_30to49sep} + \beta_{30} \mathit{age\_30to49unmarried} + \\
 & \beta_{31} \mathit{age\_70andupmar} + \beta_{32} \mathit{age\_70andupdiv} + \beta_{33} \mathit{age\_70andupwid} + \\
 & \beta_{34} \mathit{age\_70andupsep} + \beta_{35} \mathit{age\_70andupunmarried} + \beta_{36} \mathit{physhlth} + \beta_{37} \mathit{caregiver} + \\
 & \beta_{38} \mathit{smoking} + \beta_{39} \mathit{hvydrinking} + \beta_{40} \mathit{vet} + \beta_{41} \mathit{children} + \beta_{42} \mathit{exercise} + \beta_{43} \mathit{notgrad} + \\
 & \beta_{44} \mathit{hsgrad} + \beta_{45} \mathit{some\_college} + \beta_{46} \mathit{highestinc} + \beta_{47} \mathit{higherinc} + \beta_{48} \mathit{poorest} + \beta_{49} \mathit{poor} + u
 \end{aligned}$$

where all variables are binary in nature, except for *children* and *number of days in last 30 physical health “not good,”* the independent variables capture the demographic qualities, personal characteristics, and addictive habits of individual respondents, and  $u$  captures the unobservable determinants of mental health.

The biggest potential issue with any of the three regressions is omitted variable bias, which is mitigated as much as possible by including many variables that control for an individual's background that might correlate with marital status and affect mental health. However, using BRFSS survey data restricted what variables could be included. Potential variables like religion or political affiliation could reasonably correlate with marital status and affect mental health, but these were not questions asked in the 2016 survey.

Because the BRFSS 2016 survey provided 275 questions, many of these questions measured similar data. Issues of multicollinearity were mitigated by not including more than one variable that showed a similar effect, like including "household income level" and not "times past 12 months worried/stressed about having enough money to pay rent."

### ***Results***

Table 3 displays the calculated number of days mental health "not good" for each demographic, based on age, gender, race, and marital status. Out of the 49 variables in this regression, 30 were statistically significant at the one 1% level. Of all the calculated numbers of days mental health "not good" for each marital status, each calculation had significance at the 5% level for at least half of the coefficients used in the estimation, with all married coefficients significant at the 1% level.

Widowed white females under 30, on average, exhibited the worst mental health with 7.4 days of poor mental health, while nonwhite men over 70 who never married showed the best mental health at around -0.01 days. Though intuitively, negative values do not make sense, consistently nonwhite males over 70 showed the strongest mental health, while white females under 30 showed the weakest mental health. However, it is critical to note that some of this difference could be attributed to generational variance in gender norms, where older men were conditioned to be more restrictive in the emotions that they expressed.

Across all categories, married individuals had the lowest days mental health "not good," and men exhibited stronger mental health across all races, ages, and marital statuses, based on self-reported mental health. All other marital statuses were less defined, with varying levels of mental health based on age and gender. For example, being widowed and under 30 was associated with the worst levels of mental health (7.20 days), but those that were widowed and over the age of 30 had consistently stronger mental health than some of their counterparts that were separated or even never married (for individuals over 70).

Overall, the youngest age group showed the most variation in mental health by marital status, varying from 2.36 to 7.42 days mental health "not good", and the oldest showed the least variation, varying from -1.01 to 2.47 days. Both nonwhites

and males, on average, were associated with less days mental health “not good” than whites and females, respectively.

**Table 3: Results of Marital Status on Days Mental Health “Not Good” in Last 30 Days**

<i>Never Married</i>		Male		Female	
		White	Nonwhite	White	Nonwhite
<i>Under 30</i>		3.740	2.860	4.996	4.116
<i>30-49</i>		3.303	2.423	4.559	3.679
<i>50-69</i>		1.933	1.053	3.189	2.309
<i>Over 70</i>		-0.134	-1.015	1.122	0.241
<i>Married</i>		Male		Female	
		White	Nonwhite	White	Nonwhite
<i>Under 30</i>		2.677	2.357	3.612	3.292
<i>30-49</i>		2.291	1.970	3.226	2.906
<i>50-69</i>		1.334	1.014	2.269	1.949
<i>Over 70</i>		0.306	-0.014	1.242	0.922
<i>Divorced</i>		Male		Female	
		White	Nonwhite	White	Nonwhite
<i>Under 30</i>		4.052	3.722	5.371	5.041
<i>30-49</i>		3.611	3.281	4.931	4.601
<i>50-69</i>		1.912	1.582	3.232	2.902
<i>Over 70</i>		-0.124	-0.454	1.195	0.865
<i>Widowed</i>		Male		Female	
		White	Nonwhite	White	Nonwhite
<i>Under 30</i>		7.201	6.855	7.417	7.071
<i>30-49</i>		4.849	4.503	5.065	4.719
<i>50-69</i>		2.808	2.463	3.024	2.679
<i>Over 70</i>		0.468	0.123	0.684	0.339
<i>Separated</i>		Male		Female	
		White	Nonwhite	White	Nonwhite
<i>Under 30</i>		5.133	2.964	6.329	4.160
<i>30-49</i>		5.424	3.255	6.621	4.451
<i>50-69</i>		4.116	1.947	5.312	3.143
<i>Over 70</i>		1.172	-0.997	2.368	0.199

<i>Unmarried Couple</i>	Male		Female	
	White	Nonwhite	White	Nonwhite
<i>Under 30</i>	4.253	3.115	5.401	4.263
<i>30-49</i>	3.299	2.161	4.447	3.309
<i>50-69</i>	2.115	0.976	3.262	2.124
<i>Over 70</i>	0.539	-0.599	1.687	0.549

Table 4 depicts the calculated results of the second regression on *depressive disorder*, the first of the two binary outcome variables, for each marital status. Because marriage is the marital status of interest, all other marital statuses are compared to this base group, and the interactions with gender, race, and age are shown with married individuals. For both the second and third regressions, a base probability is calculated for a married white man with an age between 50 and 69, an average of 4 days out of the last 30 physical health “not good,” one child, a college degree, income over 50K a year, who exercises at least once a month. Then, by changing one aspect of that base group, the percentage change in probability of being diagnosed with a depressive disorder is noted.

Of the 49 variables included, only 10 were statistically insignificant. For the baseline group of white, aged 50-69, and male (all coefficients significant at the 1% level), never married, married, separated, and unmarried couple all had coefficients significant at the 5% level. Again, being married was associated with an increase in mental health, in this case a decrease in the probability of being diagnosed with a depressive disorder. Similar to the results of the first regression, females were nearly 93% more likely to be diagnosed with a depressive disorder than males, and whites were 32% more likely to be diagnosed than nonwhites. Generally, there was a positive correlation between age and probability of diagnosis. Individuals over 70 exhibited the lowest probability of being diagnosed with a depressive disorder at roughly 6%, while those between the ages of 30 and 49 had the highest probability of diagnosis at 11%.

However, unlike the first regression, this outcome variable is dependent on a formal medical diagnosis. Men are generally more reluctant to go to the doctor than women, and minorities are less likely to seek medical care in the U.S. than whites. Without a doctor’s diagnosis, a depressed respondent would not be included as “diagnosed with a depressive disorder.” Therefore, a portion of the differences by race and gender could be attributed to the difference between these groups in obtaining medical care.

**Table 4: Results of Marital Status on if Respondent Diagnosed with a Depressive Disorder**

<i>Variable (movement)</i>	<i>Probability of being diagnosed with a depressive disorder</i>	<i>% change in probability</i>
Base: married, white, male, 50-69	9.81%	--
Marital Status		
(never married)	14.53%	48.17%
(divorced)	14.37%*	46.55%
(separated)	18.81%	91.81%
(widowed)	14.19%*	44.66%
(unmarried couple)	15.99%	63.07%
Female		
(male to female)	18.88%	92.49%
Nonwhite		
(white to nonwhite)	6.63%	-32.43%
Age		
(50-69 to under 30)	10.54%*	7.52%
(50-69 to 30-49)	11.13%	13.53%
(50-69 to over 70)	5.74%	-41.42%

\*coefficient was not statistically significant at the 10% level

The calculated results of the third regression, the effect of marital status on life satisfaction, can be shown in Table 5. *Satisfied*, which measures overall satisfaction with life, was the weakest proxy variable for mental health and the results corroborate this. Out of the 49 variables, 29 were not statistically significant, and of those that were significant, the p values were greater than those of the first two regressions. The same base group was significant at only the 10% level, instead of at the 5% level for *depressive disorder*, and shifts from this base group to divorced, to widowed, to a nonwhite individual, and to individuals under 30 or over 70 all failed to show significance.

Additionally, many of the predicted changes in probabilities of being satisfied with life yielded results that were contrary to the results from the first two regressions. Most notably, nonwhites were found to be less satisfied with their lives than whites, and there was less than a 1% difference in life satisfaction between males and females. Compared to the practically large effects of different marital statuses on both *number of days mental health "not good"* and *depressive disorder*, marital status had a practically insignificant effect on *satisfied*. In addition, age,



gender, and race were all associated with less than a 1% change in self-reported individual life satisfaction for married individuals.

However, the regression on *satisfied* suffers from 421,404 missing observations, and consequently, larger standard errors. Therefore, this regression suggests imprecise coefficient estimates, resulting in coefficients that were not as economically meaningful as the other regressions.

**Table 5: Results of Marital Status on if Respondent Reported “Very Satisfied” or “Satisfied”**

<i>Variable (movement)</i>	<i>Probability of being “satisfied” or “very satisfied”</i>	<i>% change in probability</i>
Base: married, white, male, 50-69	98.91%	--
Marital Status		
(never married)	97.06%	-1.87%
(divorced)	96.77%*	-2.16%
(separated)	94.52%	-4.43%
(widowed)	97.15%*	-1.78%
(unmarried couple)	98.75%	-0.15%
Female		
(male to female)	98.85%	-0.06%
Nonwhite		
(white to nonwhite)	98.75%*	-0.15%
Age		
(50-69 to under 30)	98.35%*	-0.57%
(50-69 to 30-49)	98.81%	-0.10%
(50-69 to over 70)	99.30%*	0.40%

\*coefficient was not statistically significant at the 10% level

This research was designed to mitigate omitted variable bias, problems pertaining to high multicollinearity, and potential sampling issues by using a nation-wide large and random sample. However, mental illnesses are difficult to quantify, and these regressions could only proxy for variables that might closely correlate with an individual’s mental health. The results therefore likely suffered from bias that can be attributed to the measurement of mental health. Using BRFSS survey data, this paper suffered from the reporting bias inherent in survey data.

Furthermore, there are issues with each of the dependent variables in explaining mental health. *Menthlth* measures the days out of the last 30 where a respondent’s mental health was “not good,” but this does not necessarily correlate

with the severity of a mental illness. Some individuals may suffer from a more severe mental illness but receive treatment, causing them to have less days where their mental health was “not good,” while others with less severe mental health issues may report far more days mental health “not good” if issues were left untreated. *Depressive disorder* asks a respondent if they have ever been diagnosed with a depressive disorder, but this leaves out all of the individuals who either may not have the resources to go to a physician and get a diagnosis, or refuse to be diagnosed due to the stigma surrounding mental illness. *Satisfied* likely captures a lot more in an individual’s life than mental health issues. This variable could also include how an individual feels about themselves physically, monetarily, or their general perception of the overall quality of their life.

This study could also suffer from the exclusive use of dummy variables for both my independent and dependent variables. Using these dummy variables categorizes responses as “yes” or “no” or places a response into a group such as *nograd*, *hsgrad*, *some\_college*, or *college grad*. This undoubtedly inhibits variations in responses. A respondent might feel depression often but if (s)he has not been diagnosed (s)he may respond “no.” However, this variation cannot be accounted for with the BRFSS data. Individual responses are unavailable as BRFSS already categorized the data into specific groups.

### ***Conclusion***

As attitudes toward marriage evolve and a growing number of individuals value their personal careers over any type of romantic relationship, it is important to address how marital status might affect an individual’s mental health. Some literature surrounds this topic, but it mostly focuses on a subgroup or how marital status may impact “happiness,” rather than mental health issues. While happiness is important, these studies only gauge an individual’s feelings at a point in time and do not identify life-long illnesses that impact individuals on a daily basis. This study attempts to take a step deeper, using nation-wide data to determine whether marital status has a significant effect on three measures of mental health: bad mental health days, the presence of a depressive disorder diagnosis, and overall life satisfaction.

This research provides substantial evidence that the effects of marital status on mental health are both statistically and practically significant. The results corroborate findings from Adamczyk, Chapman and Guven, Fu and Noguchi, and Vanassche et al. Marriage is associated with stronger mental health and higher levels of life satisfaction; however, women generally benefit less than men from this change. Each regression expands on the literature by providing strong evidence of several interaction effects, while utilizing a rich data set that provides nationwide insight, rather than focusing on a specific subgroup. By creating interaction terms

with marital status and gender, marital status and race, and marital status and age, it is evident that marital status' effect on mental health may differ across these three categories, most strongly by gender. However, while marriage is beneficial for mental health, it does come with risks, as the results show that individuals whose marriages end in separation, divorce, or death generally have weaker mental health than those that never married.

This research lays the foundation for future work in studying how marital status may affect mental health measures across differing demographics. Future work should extend the study of differential effects across other categories, such as income and education, and explore three-way interaction variables between age, gender, and marital status. Instrumental variables and a panel data set should also be used to address the potential reverse causality issue, where mental health has a greater effect on marital status, which was unable to be addressed in this cross-sectional study.

Still, these findings have interesting societal implications that could provide evidence for changes in policy. If marital status is linked to mental health, then states should consider mandating healthy relationship education in conjunction with programs such as sexual education. Relational attitudes and behaviors are known to develop most rapidly during adolescence, making this an optimal time to educate youth on a how to have healthy relationships (Adler-Baeder et al. 2007). According to the few studies that have researched this topic, youth-focused relationship or marital education programs are effective, as participants are generally better able to identify unhealthy relationship patterns and realistically understand marriages/relationships (Adler-Baeder et al.; Kerpelman et al. 2009).

The data indicate that married individuals have significantly stronger mental health than unmarried individuals, and individuals whose marriages end have the weakest mental health. Therefore, there is a strong incentive to educate individuals in public schools on healthy behaviors and the importance of marriage and relationships. Problems in adolescence with healthy relationships generally extend into adulthood (Kerpelman et al.). However, a policy of this type could decrease the risk of adolescents developing unhealthy relationship patterns, better preparing them for marriage and improving their individual mental health.

## APPENDIX

Table A1: Results of Marital Status on Days Mental Health “Not Good” in Last 30

<i>MENTHLTH</i>	<i>COEF.</i>	<i>S.E.</i>	<i>T</i>	<i>P&gt;T</i>	<i>[95%</i>	<i>CI]</i>
MARRIED***	-0.599	0.069	-8.620	0.000	-0.735	-0.463
DIVORCED	-0.021	0.083	-0.250	0.800	-0.184	0.142
SEPARATED***	2.183	0.168	12.960	0.000	1.853	2.513
WIDOWED***	0.875	0.106	8.270	0.000	0.668	1.082
UNMARRIED_COUPLE	0.181	0.152	1.190	0.233	-0.117	0.480
FEMALE***	1.256	0.055	22.840	0.000	1.148	1.364
FEMMAR***	-0.321	0.063	-5.120	0.000	-0.443	-0.198
FEMDIV	0.063	0.081	0.780	0.435	-0.096	0.222
FEMWID***	-1.040	0.094	-11.040	0.000	-1.225	-0.855
FEMSEP	-0.060	0.164	-0.360	0.715	-0.381	0.261
FEMUNMAR	-0.108	0.133	-0.810	0.415	-0.369	0.152
NONWHITE***	-0.881	0.057	-15.320	0.000	-0.993	-0.768
NONWHITEMAR***	0.560	0.070	8.060	0.000	0.424	0.697
NONWHITEDIV***	0.551	0.090	6.090	0.000	0.373	0.728
NONWHITEWID***	0.535	0.102	5.240	0.000	0.335	0.735
NONWHITESEP***	-1.289	0.162	-7.960	0.000	-1.606	-0.971
NONWHITEUNMAR*	-0.258	0.144	-1.790	0.073	-0.539	0.024
AGE_18TO29***	1.807	0.069	26.050	0.000	1.671	1.943
AGE_30TO49***	1.370	0.077	17.850	0.000	1.220	1.521
AGE_70ANDUP***	-2.067	0.126	-16.420	0.000	-2.314	-1.821
AGE_18TO29MAR***	-0.464	0.103	-4.500	0.000	-0.666	-0.262
AGE_18TO29DIV	0.333	0.245	1.360	0.174	-0.147	0.812
AGE_18TO29WID***	2.586	0.822	3.140	0.002	0.974	4.198
AGE_18TO29SEP**	-0.790	0.324	-2.440	0.015	-1.425	-0.154
AGE_18TO29UNMARRIED*	0.332	0.176	1.890	0.059	-0.013	0.676
AGE_30TO49MAR***	-0.413	0.085	-4.860	0.000	-0.580	-0.247
AGE_30TO49DIV***	0.329	0.107	3.080	0.002	0.119	0.538
AGE_30TO49WID***	0.671	0.237	2.830	0.005	0.205	1.136
AGE_30TO49SEP	-0.062	0.182	-0.340	0.733	-0.418	0.294
AGE_30TO49UNMARRIED	-0.186	0.174	-1.070	0.286	-0.527	0.156
AGE_70ANDUPMAR***	1.040	0.132	7.900	0.000	0.782	1.298
AGE_70ANDUPDIV	0.031	0.146	0.210	0.832	-0.255	0.317
AGE_70ANDUPWID*	-0.273	0.143	-1.900	0.057	-0.553	0.008
AGE_70ANDUPSEP***	-0.877	0.295	-2.970	0.003	-1.456	-0.298
AGE_70ANDUPUNMARRIED	0.492	0.318	1.550	0.121	-0.130	1.115
PHYSHLTH***	0.275	0.001	214.430	0.000	0.273	0.278
CAREGIVER***	0.862	0.060	14.290	0.000	0.744	0.980
SMOKING***	1.818	0.032	56.650	0.000	1.755	1.881
HVYDRINKING***	0.900	0.045	19.800	0.000	0.811	0.989
VET***	0.267	0.036	7.440	0.000	0.197	0.338
CHILDREN***	0.035	0.013	2.760	0.006	0.010	0.061
EXERCISE***	-0.624	0.027	-23.550	0.000	-0.676	-0.572
NOTGRAD***	0.300	0.048	6.280	0.000	0.206	0.393
HSGRAD	-0.037	0.029	-1.260	0.209	-0.094	0.021
SOME_COLLEGE***	0.224	0.028	8.040	0.000	0.170	0.279
HIGHESTINC***	-0.498	0.031	-16.310	0.000	-0.558	-0.438
HIGHERINC***	-0.182	0.038	-4.790	0.000	-0.257	-0.108
POOREST***	1.799	0.045	39.930	0.000	1.711	1.888
POOR***	0.614	0.037	16.760	0.000	0.543	0.686
_CONS	1.933	0.072	26.720	0.000	1.791	2.075

Notes: \*\*\*, \*\*, and \* indicate significance at the .01, .05, and .10 levels respectively.

Table A2: Results of Marital Status on Depressive Disorder Diagnosis

DEPRESSIVE_DISORDER	COEF.	S.E.	Z	P>Z	[95%	CI]
MARRIED***	-0.447	0.027	-16.760	0.000	-0.499	-0.395
DIVORCED	-0.013	0.030	-0.420	0.673	-0.073	0.047
SEPARATED***	0.310	0.058	5.350	0.000	0.196	0.423
WIDOWED***	-0.028	0.041	-0.680	0.495	-0.109	0.053
UNMARRIED_COUPLE	0.113	0.055	2.040	0.041	0.005	0.222
FEMALE***	0.568	0.021	27.360	0.000	0.528	0.609
FEMMAR***	0.193	0.025	7.810	0.000	0.144	0.241
FEMDIV	0.135	0.030	4.520	0.000	0.076	0.194
FEMWID***	-0.078	0.039	-2.000	0.045	-0.154	-0.002
FEMSEP	0.054	0.057	0.960	0.338	-0.057	0.166
FEMUNMAR	0.046	0.049	0.950	0.344	-0.050	0.142
NONWHITE***	-0.621	0.022	-27.600	0.000	-0.665	-0.577
NONWHITEMAR***	0.194	0.029	6.800	0.000	0.138	0.250
NONWHITEDIV***	0.227	0.034	6.770	0.000	0.161	0.293
NONWHITEWID***	0.395	0.040	9.810	0.000	0.316	0.473
NONWHITESEP***	-0.075	0.056	-1.350	0.176	-0.185	0.034
NONWHITEUNMAR*	-0.042	0.054	-0.780	0.436	-0.149	0.064
AGE_18TO29***	0.028	0.026	1.100	0.270	-0.022	0.078
AGE_30TO49***	0.197	0.027	7.170	0.000	0.143	0.251
AGE_70ANDUP***	-0.773	0.054	-14.410	0.000	-0.878	-0.668
AGE_18TO29MAR***	0.053	0.041	1.290	0.196	-0.027	0.132
AGE_18TO29DIV	0.226	0.081	2.780	0.005	0.067	0.386
AGE_18TO29WID***	0.554	0.266	2.080	0.037	0.032	1.075
AGE_18TO29SEP**	0.189	0.106	1.770	0.076	-0.020	0.397
AGE_18TO29UNMARRIED*	0.113	0.063	1.810	0.071	-0.010	0.236
AGE_30TO49MAR***	-0.055	0.031	-1.760	0.078	-0.117	0.006
AGE_30TO49DIV***	0.079	0.037	2.140	0.032	0.007	0.152
AGE_30TO49WID***	0.179	0.078	2.300	0.022	0.026	0.332
AGE_30TO49SEP	-0.031	0.061	-0.500	0.615	-0.150	0.088
AGE_30TO49UNMARRIED	-0.125	0.062	-2.030	0.042	-0.246	-0.004
AGE_70ANDUPMAR***	0.194	0.057	3.430	0.001	0.083	0.305
AGE_70ANDUPDIV	0.091	0.060	1.500	0.134	-0.028	0.209
AGE_70ANDUPWID*	-0.138	0.059	-2.320	0.020	-0.254	-0.022
AGE_70ANDUPSEP***	0.150	0.112	1.350	0.178	-0.069	0.369
AGE_70ANDUPUNMARRIED	0.233	0.126	1.850	0.064	-0.014	0.480
PHYSLTH***	0.048	0.000	113.070	0.000	0.047	0.048
CAREGIVER***	0.342	0.021	15.900	0.000	0.300	0.384
SMOKING***	0.478	0.011	42.900	0.000	0.456	0.500
HVYDRINKING***	0.117	0.017	6.800	0.000	0.083	0.150
VET***	0.238	0.015	15.720	0.000	0.208	0.267
CHILDREN***	-0.027	0.005	-5.270	0.000	-0.036	-0.017
EXERCISE***	-0.226	0.010	-22.790	0.000	-0.245	-0.207
NOTGRAD***	0.014	0.018	0.770	0.439	-0.021	0.049
HSGRAD	-0.142	0.012	-11.950	0.000	-0.165	-0.119
SOME_COLLEGE***	0.048	0.011	4.340	0.000	0.026	0.070
HIGHESTINC***	-0.179	0.012	-14.370	0.000	-0.203	-0.154
HIGHERINC***	-0.002	0.015	-0.140	0.892	-0.032	0.027
POOREST***	0.521	0.016	33.260	0.000	0.490	0.552
POOR***	0.254	0.014	18.590	0.000	0.227	0.280
_CONS	-1.769	0.027	-65.430	0.000	-1.822	-1.716

Notes: \*\*\*, \*\*, and \* indicate significance at the .01, .05, and .10 levels respectively.

Table A3: Results of Marital Status on Life Satisfaction

SATISFIED	COEF.	S.E.	Z	P>Z	[95%	CI]
MARRIED***	1.009	0.165	6.110	0.000	0.685	1.332
DIVORCED	-0.098	0.164	-0.600	0.550	-0.420	0.224
SEPARATED**	-0.648	0.312	-2.080	0.038	-1.259	-0.037
WIDOWED	0.032	0.243	0.130	0.896	-0.444	0.508
UNMARRIED_COUPLE*	0.621	0.366	1.700	0.089	-0.095	1.338
FEMALE**	0.370	0.122	3.040	0.002	0.132	0.609
FEMMAR**	-0.423	0.167	-2.530	0.011	-0.750	-0.096
FEMDIV	-0.066	0.170	-0.390	0.699	-0.399	0.268
FEMWID	0.060	0.233	0.260	0.796	-0.397	0.517
FEMSEP	0.213	0.319	0.670	0.504	-0.412	0.838
FEMUNMAR*	-0.635	0.347	-1.830	0.068	-1.316	0.046
NONWHITE	0.115	0.136	0.850	0.397	-0.151	0.380
NONWHITEMAR	-0.247	0.208	-1.190	0.236	-0.655	0.161
NONWHITEDIV	-0.133	0.199	-0.670	0.502	-0.522	0.256
NONWHITEWID	0.208	0.271	0.770	0.444	-0.323	0.739
NONWHITESEP	0.238	0.326	0.730	0.465	-0.401	0.877
NONWHITEUNMAR	-0.119	0.400	-0.300	0.766	-0.904	0.666
AGE_18TO29	-0.159	0.151	-1.050	0.293	-0.454	0.137
AGE_30TO49**	-0.314	0.154	-2.040	0.042	-0.616	-0.012
AGE_70ANDUP	0.417	0.310	1.350	0.178	-0.190	1.025
AGE_18TO29MAR	-0.260	0.303	-0.860	0.391	-0.855	0.335
AGE_18TO29DIV	-0.071	0.527	-0.140	0.892	-1.103	0.961
AGE_18TO29WID	0.000	omitted				
AGE_18TO29SEP	0.042	0.667	0.060	0.949	-1.265	1.349
AGE_18TO29UNMARRIED	-0.230	0.422	-0.550	0.585	-1.057	0.597
AGE_30TO49MAR	0.227	0.204	1.110	0.267	-0.173	0.627
AGE_30TO49DIV	0.049	0.210	0.230	0.815	-0.362	0.460
AGE_30TO49WID	-0.601	0.430	-1.400	0.163	-1.444	0.242
AGE_30TO49SEP	0.230	0.343	0.670	0.503	-0.443	0.903
AGE_30TO49UNMARRIED	0.317	0.430	0.740	0.461	-0.526	1.160
AGE_70ANDUPMAR	0.029	0.352	0.080	0.934	-0.661	0.719
AGE_70ANDUPDIV	0.089	0.355	0.250	0.803	-0.607	0.784
AGE_70ANDUPWID	0.120	0.352	0.340	0.734	-0.570	0.809
AGE_70ANDUPSEP	0.967	0.858	1.130	0.260	-0.715	2.650
AGE_70ANDUPUNMARRIED	0.000	omitted				
PHYSHLTH***	-0.060	0.003	-24.050	0.000	-0.065	-0.055
CAREGIVER***	-0.264	0.079	-3.360	0.001	-0.418	-0.110
SMOKING***	-0.562	0.067	-8.340	0.000	-0.694	-0.430
HVYDRINKING***	-0.278	0.115	-2.410	0.016	-0.503	-0.052
VET	0.128	0.110	1.160	0.248	-0.089	0.344
CHILDREN	-0.002	0.036	-0.040	0.965	-0.073	0.069
EXERCISE***	0.431	0.065	6.640	0.000	0.304	0.558
NOTGRAD	0.092	0.111	0.820	0.411	-0.127	0.310
HSGRAD***	0.281	0.086	3.280	0.001	0.113	0.449
SOME_COLLEGE	0.018	0.081	0.220	0.827	-0.142	0.177
HIGHESTINC***	0.859	0.097	8.860	0.000	0.669	1.049
HIGHERINC***	0.468	0.111	4.220	0.000	0.251	0.686
POOREST***	-0.529	0.090	-5.880	0.000	-0.706	-0.353
POOR**	-0.183	0.085	-2.160	0.031	-0.349	-0.017
_CONS	2.450	0.157	15.600	0.000	2.142	2.757

Notes: \*\*\*, \*\*, and \* indicate significance at the .01, .05, and .10 levels respectively.

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