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# MANDATORY WAITING PERIODS FOR ABORTIONS AND FEMALE MENTAL HEALTH

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## INTRODUCTION

Econometric studies of the effects of changes in abortion policy on a host of social phenomena have proliferated in recent years.<sup>1</sup> Researchers have studied the effects of abortion access in many areas including crime,<sup>2</sup> risky sexual behavior,<sup>3</sup> child abuse,<sup>4</sup> welfare expen-

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<sup>1</sup> For a non-technical review of this literature, see Jonathan Klick, *Econometric Analyses of U.S. Abortion Policy: A Critical Review*, 31 *FORDHAM URB. L. J.* 751 (2004) (using econometric research to analyze the effect of the United States' abortion policy on sexual behavior, crime, opportunities for women, and public finance).

<sup>2</sup> See, e.g., John J. Donohue III & Steven D. Levitt, *The Impact of Legalized Abortion on Crime*, 116 *Q. J. ECON.* 379 (2001) (arguing that legalized abortion has contributed to a drop in crime rates); Ted Joyce, *Did Legalized Abortion Lower Crime?*, 39 *J. HUM. RESOURCES* 1 (2004) (finding little evidence that legalized abortion had an effect on crime rates); and John J. Donohue III & Steven D. Levitt, *Further Evidence That Legalized Abortion Lowered Crime: A Reply to Joyce*, 39 *J. HUM. RESOURCES* 29 (2004) (linking legalized abortion and reduced crime rates).

<sup>3</sup> See, e.g., Jonathan Klick & Thomas Stratmann, *The Effect of Abortion Legalization on Sexual Behavior: Evidence from Sexually Transmitted Diseases*, 32 *J. LEGAL STUD.* 407 (2003) (testing the hypothesis that legalized abortion has led to an increase in sexually transmitted diseases); and Jonathan Klick & Thomas Stratmann, *Abortion Access and Risky Sex Among Teens: Parental Involvement Laws and Sexually Transmitted Diseases* (Oct. 3, 2005) (unpublished manuscript), available at [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=819304](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=819304) (finding that teen gonorrhea rates dropped for Hispanic and white teens after implementation of parental involvement laws concerning abortion; effects on black teens were not statistically significant).

<sup>4</sup> See, e.g., Marianne Bitler and Madeline Zavodny, *Child Abuse and Abortion Availability*, 92 *AM. ECON. REV.* 363 (2002) (analyzing the relationship between child abuse rates and the legalization of abortion); and Susan B. Sorenson et al., *Legalized Abortion and the Homicide of Young Children: An Empirical Investigation*, 2 *ANALYSES SOC. ISSUES PUB. POL'Y* 239 (2002) (finding that the legalization of abortion led to a reduction in the number of one- to four-year old homicide victims).

ditures,<sup>5</sup> and demographic changes.<sup>6</sup> Others have looked at the effect of changes in abortion access on the welfare of women as a group, focusing on the economic opportunities that abortion indirectly provides to the extent it allows women to take control over their reproductive functions.<sup>7</sup>

Relying on some of these studies, as well as more normative arguments, abortion rights groups argue that abortion on demand has significantly improved the lives of women and society more generally.<sup>8</sup> In fighting against state restrictions on abortion access, these groups suggest women's interests will be harmed if any limitations are placed on the right to have an abortion.<sup>9</sup>

Although anti-abortion groups generally focus on harm done to the unborn baby to justify the abortion restrictions they seek at both the state and federal levels,<sup>10</sup> in the case of mandatory waiting periods they appear to depart from their general strategy. The primary argument offered in support of these waiting periods is that they help women make more reasoned decisions about the resolution of their unplanned pregnancies.<sup>11</sup> That is, given the emotionally charged nature of the decision, supporters of waiting periods suggest a cooling

<sup>5</sup> See, e.g., Jonathan Gruber et al., *Abortion Legalization and Child Living Circumstances: Who Is the "Marginal Child"?*, 114 Q. J. ECON. 253 (1999) (examining and comparing the potential living circumstances of the marginal child not born because of abortion to the living circumstances of the average child born).

<sup>6</sup> See generally PHILLIP B. LEVINE, SEX AND CONSEQUENCES: ABORTION, PUBLIC POLICY, AND THE ECONOMICS OF FERTILITY (2004) (analyzing the effect of abortion policy on birth rates domestically and internationally).

<sup>7</sup> See, e.g., Joshua D. Angrist & William N. Evans, *Schooling and Labor Market Consequences of the 1970 State Abortion Reforms* (Nat'l Bureau of Econ. Research, Working Paper No. 5406, 1996). However, for some potential problems created by abortion availability, see George A. Akerlof et al., *An Analysis of Out-of-Wedlock Childbearing in the United States*, 111 Q. J. ECON. 277 (1996) (advancing theoretical reasons why technical advances in abortion and female contraception have led to a rise in out-of-wedlock births).

<sup>8</sup> See, e.g., SUSANNE PICHLER, PLANNED PARENTHOOD FEDERATION OF AMERICA, INC., MEDICAL AND SOCIAL HEALTH BENEFITS SINCE ABORTION WAS MADE LEGAL IN THE U.S. (2002), <http://www.plannedparenthood.org/pp2/portal/files/portal/medicalinfo/abortion/fact-abortion-medical-social-benefits.xml>.

<sup>9</sup> See, e.g., NARAL PRO-CHOICE AMERICA, LEADING MEDICAL GROUPS OPPOSE OBSTACLES TO ABORTION (2002), <http://www.prochoiceamerica.org/facts/loader.cfm?url=/commonspot/security/getfile.cfm&PageID=1715>.

<sup>10</sup> See, e.g., AMERICAN LIFE LEAGUE, FETAL PAIN: AN AGONIZING REALITY, <http://www.all.org/issues/ab12.htm> (last visited Oct. 28, 2005).

<sup>11</sup> See, e.g., Pro-Life News, *Waiting Period Does Not Hinder the Murder of Children*, COVENANT NEWS, June 24, 2005, <http://www.covenantnews.com/abortion/archives/013201.html>.

off period so that pregnant women do not make rash decisions they will later regret.<sup>12</sup>

Opponents of waiting periods believe they do little to improve the welfare of women. At best, according to many pro-choice advocates, waiting periods have no effect on women's decisions. At worst, the delay magnifies a woman's mental anguish in dealing with the unwanted pregnancy, as well as extending the period of physical stress. Often, they claim that waiting periods are simply a device used to increase the cost and effort involved in securing an abortion.

Although most individuals decide their positions regarding abortion on the basis of normative precepts, the debate about this particular abortion restriction is premised on empirical assertions. That is, both sides appear to base their positions on beliefs about how waiting periods affect the mental health of women. Anti-abortion groups claim that women tend to make rash decisions about abortion, leading to regret and emotional distress later in life. In their view, waiting periods will lead to better decision making processes and, presumably, less regret. Pro-choice groups, on the other hand, believe waiting periods are at least an annoyance and might cause significant emotional or psychological harm as women are kept from exercising their rights.

In this paper, I attempt to shed light on these empirical claims by analyzing the effect of waiting periods on adult female suicide rates. My results suggest that waiting periods do improve mental health among females as evidenced by a statistically and practically significant drop in the suicide rate when states adopt waiting periods. The result does not appear to be an artifact of unobserved heterogeneity or simultaneity as it is robust to a variety of powerful specifications, including instrumental variables analysis.

In the section that follows, I motivate the use of suicide as my metric of mental health. I then describe the data I use in my analysis and discuss the statistical models I implement. After that, I present the results from various specifications to demonstrate that the effect is robust and appears to be causal. I follow the results with a discussion of alternate mechanisms that could be generating these results, and I highlight some extensions of the analysis that are in preparation.

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<sup>12</sup> See, e.g., National Right to Life Committee, *Is Abortion Safe?: Psychological Consequences*, <http://www.nrlc.org/abortion/ASMF/asmf14.html> (last visited Oct. 23, 2005) (describing the psychological effects some women experience after going through an abortion).

## I. SUICIDE AS A PROXY FOR MENTAL HEALTH

Both sides in the debate about how waiting periods affect the welfare of women make empirical claims about the relationship between abortion and mental health. Supporters of mandatory delays suggest that women who make rash, irreversible decisions about their pregnancies often regret those decisions. This regret, according to their claims, leads to depression. Thus, waiting periods should improve the mental health of women with unwanted pregnancies by giving them a chance to reflect on their decisions.<sup>13</sup> Opponents of the laws imply that delays in securing an abortion at least generate annoyances for women who do not want to continue their pregnancies. In some cases, they argue, the delays will actually be harmful to a woman's mental health as she is forced to second-guess her decision potentially leading to depression. In this view, the adoption of waiting periods should lead to either no substantial effect or a negative effect on the mental health of those seeking an abortion.

Research suggests that suicide is strongly correlated with depression.<sup>14</sup> Some people who study suicide estimate that more than two-thirds of people who commit suicide suffer from depressive illness.<sup>15</sup> For the present purpose, suicide should be a strong indicator of poor mental health. One could argue, however, that suicide reflects only very severe mental health problems. If the anguish created or mitigated by abortion delay laws is of a relatively small magnitude, suicide will be largely unaffected by the adoption of the laws. This concern biases any analysis using suicide as the dependent variable toward finding no effect of delays on mental health. On the other hand, if a statistically significant effect of delay laws on suicide is found, positive or negative, it is reasonable to assume that the effect underestimates the magnitude of the true causal relationship between delay laws and mental health.

Further, it is interesting to note, anti-abortion advocates have claimed there is a causal link between abortion and suicide arising out of this regret-based depression.<sup>16</sup> Relying on some academic work on

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<sup>13</sup> Note that in many states, the waiting period follows the distribution of counseling materials that include information about alternatives to abortion.

<sup>14</sup> See Jonathan Klick & Sara Markowitz, *Are Mental Health Insurance Mandates Effective?: Evidence from Suicides*, 15 HEALTH ECON. 83, 87 (2006).

<sup>15</sup> See John T. Maltzberger, *The Psychodynamic Formulation: An Aid in Assessing Suicide Risk*, in ASSESSMENT AND PREDICTION OF SUICIDE 25, 31 (Ronald W. Maris et al. eds., 1992) ("About 70 [percent] [of persons who commit suicide] have significant depressive illnesses or alcoholism, or both.").

<sup>16</sup> See, e.g., National Right to Life Committee, *supra* note 12.

the subject, they point out that suicide rates tend to be higher among women who abort their pregnancy rather than miscarry or carry the baby to term.<sup>17</sup> However, such a finding could very well be the result of a self-selection bias. That is, it could be the case that women who choose to abort their pregnancies tend to be those who are predisposed to depression, implying that the link between abortion and suicide is coincidental as opposed to causal.

From a data perspective, suicide represents a well measured, consistent, and objective metric of mental health. The suicide data that are used in this analysis cover all known suicides in the country during the period 1981–1998. Further, at least as regards precise measurement and comprehensiveness, suicide data is far superior to the next best option, which would involve survey data regarding individuals' subjective evaluations of their own mental states.

## II. DATA

For this paper, I examine state level female suicide rates as my dependent variable. I focus on suicides among women between the ages of twenty-five and sixty-four. I do not include very old women since they are past their reproductive window and their mental health should not be affected by abortion policy. I also exclude minors and very young adults since, during this same period, a number of states passed laws limiting minors' access to abortion.<sup>18</sup> While these laws should be unimportant for the mental health of adult women, they could represent an important confounding effect on the mental health of teens.<sup>19</sup>

The female suicide rate is defined as the number of completed suicides among women age twenty-five to sixty-four in the state per 100,000 women in that age range in the state. My analysis covers the period 1981–1998. Data on completed suicides come from the National Center for Health Statistics' Compressed Mortality File,<sup>20</sup> which contains information on all completed suicides over time. These data are collected from death certificates filed in each state and

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<sup>17</sup> Mika Gissler et al., *Suicides After Pregnancy in Finland, 1987-94: Register Linkage Study*, 313 BRIT. MED. J. 1431, 1431 (1996).

<sup>18</sup> These laws took the form of parental involvement laws which require a minor to get consent from or at least inform her parents that she is planning to get an abortion.

<sup>19</sup> The author is in the process of analyzing teen suicide rates as they relate to abortion restrictions in a separate paper.

<sup>20</sup> Dep't of Health and Human Servs., Ctrs. for Disease Control & Prevention, Compressed Mortality File: Underlying Cause of Death, <http://wonder.cdc.gov/mortSQL.html> (last visited Nov. 17, 2005).

include the state of residence, age, race, and gender of each individual.<sup>21</sup> In some specifications, I also control for the male suicide rate, which is acquired from the same source and covers the same age range.

Data on state adoption of mandatory waiting periods come from Bitler and Zavodny.<sup>22</sup> For a year in which the state had a mandatory waiting period in place for the entire year, the variable takes the value of 1. The rest of the observations equal the percent of the year in which a mandatory delay law was in place. I also include a variable, constructed in a similar fashion and from the same source, measuring what fraction of the year the state had restrictions on Medicaid funding for abortions in place. Details regarding these laws are available in the Bitler and Zavodny article.<sup>23</sup>

In some specifications, I control for a host of other covariates. These include the labor force participation rate of women in the state, the unemployment rate in the state, real state income per capita, the percent of the state's population that lives in rural areas, the percent with a college education, and the respective percentages of the state population indicating they belong to the following religious groups: Mormon, Southern Baptists, Catholics, and Protestants. Descriptive statistics, as well as data sources, are available in Table 1.

Variable	Description	Mean	Std. Dev.	Source
Female Suicide Rate	Number of suicides among women ages 25-64 per 100,000 women in the population in that age range	7.085	2.288	National Center for Health Statistics, Centers for Disease Control <sup>24</sup>

<sup>21</sup> *Id.*

<sup>22</sup> Marianne Bitler & Madeline Zavodny, *The Effect of Abortion Restrictions on the Timing of Abortions*, 20 J. HEALTH ECON. 1011 (2001).

<sup>23</sup> *Id.* at 1013-14. For current state laws on mandatory waiting periods, see ALAN GUTTMACHER INST., STATE POLICIES IN BRIEF: MANDATORY COUNSELING AND WAITING PERIODS FOR ABORTION 2 (2005), [http://www.agi-usa.org/statecenter/spibs/spib\\_MWPA.pdf](http://www.agi-usa.org/statecenter/spibs/spib_MWPA.pdf). For the current state of Medicaid funding restrictions, see ALAN GUTTMACHER INST., STATE POLICIES IN BRIEF: STATE FUNDING OF ABORTION UNDER MEDICAID 2 (2005), [http://www.agi-usa.org/statecenter/spibs/spib\\_SFAM.pdf](http://www.agi-usa.org/statecenter/spibs/spib_SFAM.pdf).

<sup>24</sup> Dep't of Health and Human Servs., *supra* note 20.

**Table 1:  
Descriptive Statistics**

Variable	Description	Mean	Std. Dev.	Source
Male Suicide Rate	Number of suicides among men ages 25-64 per 100,000 men in the population in that age range	26.173	12.361	National Center for Health Statistics, Centers for Disease Control <sup>25</sup>
Delay	Percent of year state had mandatory waiting period before an abortion can be obtained in effect	0.055	0.224	Bitler and Zavodny <sup>26</sup>
Medicaid Restriction	Percent of year state restricted Medicaid funding for abortions	0.704	0.452	Bitler and Zavodny <sup>27</sup>
Female Labor Participation	Labor force participation rate of women	57.899	5.174	Bureau of Labor Statistics
Unemployment	Unemployment rate	6.279	2.175	Bureau of Labor Statistics
Real Income	Per capita income adjusted for inflation in \$100s	138.043	23.103	Bureau of Economic Analysis
Rural	Percent of state population living in rural areas	31.367	14.544	Bureau of the Census

<sup>25</sup> *Id.*

<sup>26</sup> Bitler & Zavodny, *supra* note 22.

<sup>27</sup> *Id.*



<b>Table 1: Descriptive Statistics</b>				
<b>Variable</b>	<b>Description</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Source</b>
College	Percent of state population ages 25 and older that has graduated from college	19.883	4.407	Bureau of the Census
Mormon	Percent of state population identified as belonging to Mormon religion	3.054	10.223	Glenmary Research Center <sup>28</sup>
Baptist	Percent of state population identified as belonging to Southern Baptist congregation	7.346	10.117	Glenmary Research Center <sup>29</sup>
Catholic	Percent of state population identified as being Roman Catholic	19.000	13.058	Glenmary Research Center <sup>30</sup>
Protestant	Percent of state population belonging to a mainline Protestant church	21.911	9.818	Glenmary Research Center <sup>31</sup>

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<sup>28</sup> GLENMARY RESEARCH CENTER, RELIGIOUS CONGREGATIONS & MEMBERSHIP IN THE UNITED STATES 2000: AN ENUMERATION BY REGION, STATE AND COUNTY BASED ON DATA REPORTED FOR 149 RELIGIOUS BODIES (Dale E. Jones et al. eds., 2002).

<sup>29</sup> *Id.*

<sup>30</sup> *Id.*

<sup>31</sup> *Id.*

<b>Table 1: Descriptive Statistics</b>				
<b>Variable</b>	<b>Description</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Source</b>
Psychiatrists	Number of psychiatrists practicing in state per 100,000 population	21.301	8.780	American Medical Association
Mental Health Spending	State and federal per capita spending on mental health services	41.750	21.138	National Association of State Mental Health Program Directors
Republican Governor	= 1 if state had Republican governor	0.481	0.500	Statistical Abstract of United States
Republican Lower House	Percent of seats in state legislature's lower house held by Republicans	0.432	0.175	Statistical Abstract of United States
Republican Upper House	Percent of seats in state legislature's upper house held by Republicans	0.430	0.180	Statistical Abstract of United States

### III. SPECIFICATIONS

For my dependent variable, I take the natural log of the suicide rate data described above. Although my results are qualitatively similar if I focus on the non-transformed suicide rate, taking the natural log aids in exposition of the results.<sup>32</sup> The general setup of my statistical models is to include dummy variable controls for each state to

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<sup>32</sup> Particularly, it allows one to interpret coefficients on dichotomous variables as percentage changes and coefficients on other logged variables as elasticities.

capture idiosyncratic differences in suicide rates among the states that do not change over time. I also include dummy variables for each year within the analysis to control for any national temporal effects occurring in the time period studied. The general model then takes the following form:

$$\ln(\text{suicide}_{st}) = \alpha \cdot \text{delay}_{st} + \Theta \chi_{st} + \lambda_s + \tau_t$$

in which  $s$  denotes the state and  $t$  denotes the year of the observation. The “delay” variable represents the fraction of year  $t$  in which state  $s$  had a delay law in effect. The next term represents the vector of state-level covariates for year  $t$ . The next term represents constant state specific effects, and the last term indicates individual year effects that do not vary from state to state.

To mitigate concerns that unobservable variables that affect suicide rates could be changing at the same time delay laws are adopted (e.g., changes in how fastidiously authorities investigate suspicious deaths that could be suicides), in some specifications, I include the contemporaneous measure of male suicide rates which should control for any effects that are common to all suicides.

In some instances, I also include a more complicated time effect, allowing each state to have its own independent trend in the data. For example, a particular state may be on a downward trajectory regarding suicide rates independent of anything that happens to change with respect to abortion laws.

I perform weighted least squares regression techniques on these data where I weight each observation by the female population of the state that is between the ages of twenty-five and sixty-four. I perform this weighting since the dependent variable is a rate to allow observations from larger states to have proportionately greater effect on my estimates. I also use report standard errors that are clustered at the state level. This allows for correlation among observations from a given state (say due to the continued existence of a given culture, social institutions, etc.) while assuming independence between observations from two different states.

Given recent concerns by Bertrand, Duflo, and Mullainathan,<sup>33</sup> in some specifications, I also allow for autocorrelation among observations, as well as heteroskedasticity. These concerns arise from the

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<sup>33</sup> See Marianne Bertrand et al., *How Much Should We Trust Differences-In-Differences Estimates?*, 119 Q. J. ECON. 249, 273-74 (2004) (investigating “how several standard estimation methods help deal with the serial correlation problem in the [Differences-in-Differences] context”).

likelihood that there is some inertia in state policies (i.e., once states pass a law, it is likely to endure for a while) which limits the independence of observations across time. To correct for this, I use Newey-West Heteroskedastic-Autocorrelation-Consistent (HAC) standard errors in some specifications.

#### IV. RESULTS

In the most basic regression, as described above, I regress the natural log of state suicide rates among women ages twenty-five to sixty-four for the years 1981–1998 on the delay variable, the Medicaid funding restriction variable, a set of state-specific effects, and year effects common to all states, as well as the following covariates: female labor force participation; state unemployment rate; real per capita income in the state; percent of the state's population living in rural areas; the percent of the state population with some college education; the percent of the state population that identifies itself as Mormon, Southern Baptist, Catholic, and Protestant; the number of psychiatrists per capita in the state; and state mental health spending per capita. I weight each observation by the population of women in the twenty-five to sixty-four age range and I cluster standard errors by state.

As indicated in Table 2, I find a large negative effect of the adoption of mandatory waiting periods on female suicide rates, and the effect is statistically significant at the 6 percent level. Effectively, I find that the adoption of a waiting period by a state reduces its female suicide rate by almost 10 percent. Among the covariates, I find statistically significant effects from unemployment suggesting that suicide rates and unemployment rates move in the same direction.

Also, there appears to be a negative relationship between college attendance and suicide rates. The negative relationship between Protestant market share and suicide is the only statistically significant effect I find among the religion variables. Lastly, the positive association between the presence of psychiatrists and suicide would appear to be the result of reverse causality (i.e., places with lots of suicides tend to draw more psychiatrists, not vice versa). The regression appears to explain about 80 percent of the variation in state suicide rates among women as indicated by the R squared statistic.

<b>Table 2: The Effect of Abortion Waiting Periods on Female Suicide Rates (p values in parentheses)</b>	
<b>Variable</b>	<b>Coefficient</b>
Delay	-0.094 (0.064)
Medicaid Restriction	0.061 (0.177)
Female Labor Participation	0.004 (0.381)
Unemployment	0.018 (0.007)
Real Income	-0.001 (0.610)
Rural	-0.001 (0.904)
College	-0.016 (0.004)
Mormon	-0.001 (0.990)
Baptist	0.011 (0.570)
Catholic	-0.011 (0.910)
Protestant	-0.012 (0.028)
Psychiatrists	0.025 (0.002)
Mental Health Spending	0.001 (0.514)
Observations	900
$R^2$	0.85

In the regression results presented in Table 3, I include state specific-trends which will help to rule out the possibility that the adoption of waiting periods happens to coincide with pre-existing state trends. For example, if states that adopt abortion waiting periods also happen to be states in the midst of a downward trend in female suicides, then the estimated relationship between waiting periods and suicides would not be causal.

Including the state-specific trends does not change the coefficient on waiting period adoption very much. I find that the adoption of a waiting period reduces the suicide rate by almost 11 percent and the effect is statistically significant at the 1.4 percent level. For the other covariates that had generated statistically significant coefficients, only unemployment remains important in this regression. Interestingly, this regression also implies that the adoption of state Medicaid funding restrictions is associated with an increase in the female suicide rate.<sup>34</sup> This regression explains about 84 percent of the variation in state suicide rates.

<b>Variable</b>	<b>Coefficient</b>
Delay	-0.106 (0.014)
Medicaid Restriction	0.091 (0.038)
Female Labor Participation	-0.003 (0.559)
Unemployment	0.017 (0.084)
Real Income	-0.002 (0.508)
Rural	0.001 (0.940)
College	-0.006 (0.303)
Mormon	-0.016 (0.374)
Baptist	-0.055 (0.148)
Catholic	0.014 (0.520)

<sup>34</sup> Although not examined here, the author is pursuing this result in another article. This result turns out to be robust to a number of specifications. The causal mechanism presumably involves the stress that women endure when they no longer have access to subsidized abortions such as enduring pregnancy and possibly facing the prospect of being responsible for a child the women did not want.

<b>Table 3:                      Waiting Periods and Female                      Suicide Rates                      Including State Trends                      (p values in parentheses)</b>	
<b>Variable</b>	<b>Coefficient</b>
Protestant	0.001 (0.899)
Psychiatrists	0.003 (0.664)
Mental Health Spending	0.001 (0.704)
Observations	900
R <sup>2</sup>	0.844

Before drawing conclusions about causality in statistical relationships, it is important to explore the possibility that unobserved changes are not correlated both with the dependent variable (female suicide rates) and the policy variable of interest (adoption of waiting periods). This omitted variable bias can lead to spurious correlations.<sup>35</sup> In this context, omitted variables bias could arise because of changes in the way the suicide data are collected, changes in relevant state policies (e.g., changes in alcohol taxes), etc. To mitigate this concern, in the regression presented in Table 4, I present the state-trends regression from Table 3, but now I include the male suicide rate to capture any unobserved changes that affect suicide at the time waiting periods are adopted.

Again, I find that waiting periods lead to a 10 percent decline in the female suicide rate, and this coefficient is statistically significant at the 2.2 percent level. Medicaid funding restrictions are once again associated with a statistically significant increase in suicides. Of interest, lastly, there is a very strong correlation between female and male suicide rates. The coefficient implies an elasticity of 0.42, meaning that when the male suicide rate goes up by 1 percent, the female suicide rate goes up by 0.42 percent. The regression explains more than 85 percent of the variation in state suicide rates.

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<sup>35</sup> See WILLIAM H. GREENE, *ECONOMETRIC ANALYSIS* 334 (4th ed. 2003).

<b>Table 4: Waiting Periods and Female Suicide Rates Including State Trends and Male Rates (p values in parentheses)</b>	
<b>Variable</b>	<b>Coefficient</b>
Delay	-0.104 (0.022)
Medicaid Restriction	0.074 (0.052)
ln(Male Suicide Rate)	0.417 (0.000)
Female Labor Participation	-0.004 (0.349)
Unemployment	0.011 (0.168)
Real Income	-0.002 (0.522)
Rural	-0.000 (0.973)
College	-0.005 (0.365)
Mormon	-0.005 (0.760)
Baptist	-0.036 (0.297)
Catholic	0.009 (0.069)
Protestant	-0.006 (0.339)
Psychiatrists	0.006 (0.378)
Mental Health Spending	0.001 (0.490)
Observations	900
$R^2$	0.852

As explained above, econometricians have raised some concerns about using legal changes to identify models using longitudinal data.



The concern revolves around the inertia that generally exists such that once a law is passed, it generally does not get overturned randomly. Instead, it tends to stay in effect indefinitely. This has the potential to generate autocorrelation in the estimates of these models. To mitigate this concern, I re-estimated the model presented in Table 4 using Newey-West Heteroskedastic-Autocorrelation Consistent (HAC) standard errors<sup>36</sup> choosing the lag structure optimally.<sup>37</sup>

As shown in Table 5, the statistical significance of the coefficient generated by the waiting period variable and that generated by the Medicaid funding restriction variable remain unchanged.

<b>Variable</b>	<b>Coefficient</b>
Delay	-0.104 (0.012)
Medicaid Restriction	0.074 (0.034)
ln(Male Suicide Rate)	0.417 (0.000)
Female Labor Participation	-0.004 (0.329)
Unemployment	0.011 (0.084)
Real Income	-0.002 (0.390)
Rural	-0.000 (0.970)
College	-0.005 (0.332)
Mormon	-0.005 (0.813)
Baptist	-0.036 (0.181)

<sup>36</sup> See JAMES H. STOCK & MARK W. WATSON, INTRODUCTION TO ECONOMETRICS 506 (2003) (discussing when HAC standard errors should be used).

<sup>37</sup> *Id.* at 505 (explaining how to strike a balance by choosing the number of autocorrelations depending on the sample size).

<b>Table 5: Waiting Periods and Female Suicide Rates Including State Trends and Male Rates (p values in parentheses)</b>	
<b>Variable</b>	<b>Coefficient</b>
Catholic	0.009 (0.503)
Protestant	-0.006 (0.314)
Psychiatrists	0.006 (0.372)
Mental Health Spending	0.001 (0.453)
Observations	900

The effect of the adoption of mandatory waiting periods before an abortion can be performed appears to be quite robust. That is, regardless of the model used to investigate this effect, it would appear that waiting periods reduce suicide among women in the twenty-five to sixty-four age range. Further, this effect is quite large, hovering around the 10 percent mark. Additionally, restrictions on Medicaid funding for abortions seem to have the opposite effect, yielding statistically significant increases in the female suicide rate of about 7 percent.

To subject this relationship to one more robustness check, I also examined an instrumental variables (IV) procedure to rule out the possibility that the passage of waiting periods and female suicide are somehow jointly determined. That is, for regression techniques to yield an unbiased estimate of the effect of waiting periods on suicide, it must not be the case that waiting periods are adopted in response to suicide rates or that some unknown factor is causally related to both suicide rates and the adoption of waiting periods.<sup>38</sup>

To implement IV procedures in this context, one must identify a set of "instruments" that are predictive of the adoption of mandatory waiting periods that are otherwise unrelated to female suicide rates. The analyst then performs a two-step procedure in which the waiting

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<sup>38</sup> See JEFFREY M. WOOLDRIDGE, *ECONOMETRIC ANALYSIS OF CROSS SECTION AND PANEL DATA* 83-107 (2002) (discussing instrumental variable estimation).

period variable is regressed on all of the covariates and the set of instruments to yield estimates of the likelihood that the waiting period is in effect in a given state during a given year. These predicted variables are then used in the second stage of the regression as proxies for the delay variable. If the set of instruments is highly predictive of the delay variable, and diagnostic tests suggest that the instruments are not otherwise related to suicide rates, the coefficient estimated in the second stage represents an unbiased estimate of the causal effect of adopting waiting periods on female suicide rates.

For my IV estimation, I use the following instruments. First, I include an indicator for whether or not the state's governor is from the Republican Party. Presumably, Republicans are more likely to support restrictions on abortion access, so we should expect a positive relationship between this instrument and the adoption of mandatory delay laws. Second, I include the fraction of seats in the state's lower legislative body that are held by Republicans based on the same intuition. Third, I include the fraction of seats in the state's upper legislative body that are held by Republicans for the same reason.

I present the first stage results in Table 6. As predicted, all of my instruments have a statistically significant positive effect on the adoption of waiting periods. Further, their joint significance of 10.58 is quite high, suggesting that they are powerful instruments in the first stage.<sup>39</sup>

Variable	Coefficient
Republican Governor	0.052 (0.000)
Republican Lower House	0.316 (0.005)
Republican Upper House	0.306 (0.006)
Medicaid Restriction	-0.016 (0.562)

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<sup>39</sup> The conventional cut-off for a first stage F statistic for the instruments is 10. See John Bound et al., *Problems with Instrumental Variables Estimation When the Correlation Between the Instruments and the Endogenous Explanatory Variable Is Weak*, 90 J. AM. STAT. ASS'N 443 (1995).

<b>Table 6: First Stage Regression Predicting the Adoption of Waiting Periods (p values in parentheses)</b>	
<b>Variable</b>	<b>Coefficient</b>
ln(Male Suicide Rate)	0.000 (0.997)
Female Labor Participation	0.002 (0.607)
Unemployment	0.016 (0.005)
Real Income	0.007 (0.000)
Rural	-0.046 (0.000)
College	0.014 (0.016)
Mormon	-0.115 (0.000)
Baptist	0.043 (0.033)
Catholic	0.036 (0.000)
Protestant	-0.006 (0.119)
Psychiatrists	0.001 (0.869)
Mental Health Spending	0.000 (0.952)
Observations	899
F for Instruments	10.58 (0.000)
R <sup>2</sup> for Instruments	0.067
R <sup>2</sup>	0.788

The second stage results are presented in Table 7. Again, I find that the adoption of waiting periods has a statistically significant ( $p = 4.8$  percent) negative effect on female suicide rates. These results im-

ply that my earlier regressions underestimated the true causal effect of delay laws. The IV results suggest that the passage of waiting period laws lowers female suicide rates by about 30 percent. Further, the test of overidentifying restrictions suggests that the instruments are exogenous to female suicide rates.<sup>40</sup> This diagnostic statistic along with the high first stage F suggests that these results sufficiently account for any bias arising for simultaneous determination of the adoption of mandatory waiting periods and female suicide rates.

<b>Table 7: Second Stage Results from IV Analysis of Waiting Periods and Suicide (p values in parentheses)</b>	
<b>Variable</b>	<b>Coefficient</b>
Delay	-0.298 (0.048)
Medicaid Restriction	0.066 (0.060)
ln(Male Suicide Rate)	0.414 (0.000)
Female Labor Participation	-0.004 (0.340)
Unemployment	0.016 (0.025)
Real Income	-0.001 (0.825)
Rural	-0.010 (0.384)
College	-0.002 (0.611)
Mormon	-0.029 (0.388)
Baptist	-0.032 (0.214)
Catholic	0.015 (0.196)

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<sup>40</sup> See WOOLDRIDGE, *supra* note 38, at 122-24 (explaining testing of overidentifying restrictions).

<b>Table 7: Second Stage Results from IV Analysis of Waiting Periods and Suicide (p values in parentheses)</b>	
<b>Variable</b>	<b>Coefficient</b>
Protestant	-0.006 (0.244)
Psychiatrists	0.006 (0.377)
Mental Health Spending	0.001 (0.539)
Observations	899
$R^2$	0.848
Hansen J Statistic	0.215 (0.898)

## V. POSSIBLE CAUSAL MECHANISMS

Given the foregoing results, it appears as though there is a strong causal relationship between the adoption of mandatory waiting periods for abortions and female suicide rates. What mechanism drives this decrease in suicide rates? I have suggested, on the basis of the arguments made by supporters of waiting periods, that waiting periods induce added reflection on the part of a woman seeking an abortion. This added reflection presumably causes a woman to have less regret after having an abortion, decreasing the incidence of depression and ultimately of suicide.

However, it could be the case that waiting periods generate this effect by reducing the number of abortions. If abortion itself leads to a heightened risk for suicide, then a decrease in the number of abortions would be expected to lower the suicide rate. It is not clear whether waiting periods do reduce the abortion rate,<sup>41</sup> so this mechanism is

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<sup>41</sup> See, e.g., Ted Joyce & Robert Kaestner, *The Impact of Mandatory Waiting Periods and Parental Consent Laws on the Timing of Abortion and State of Occurrence Among Adolescents in Mississippi and South Carolina*, 20 J. POL'Y ANALYSIS & MGMT. 263 (2001) (finding that waiting periods might cause individuals to travel to other states to obtain an abortion but that generally waiting periods have no effect on the timing of abortions). Bitler and Zavodny find no systematic effect of waiting periods on abortion rates, though, in some specifications, they do find that the adoption of waiting periods is associated with a shift in the timing of abortions with post first term abortions substituted for first term abortions. Bitler & Zavodny, *supra* note

questionable and deserves more study. Further, the results regarding the effect of Medicaid funding restrictions cut against this interpretation as well. I find indications of a positive association between Medicaid funding restrictions and the suicide rate that are fairly robust, and others have documented the negative relationship between funding restrictions and the abortion rate.<sup>42</sup> Thus, if there was a strong positive association between abortion and suicide, we would expect to see a negative coefficient for the Medicaid funding restriction variable in the regressions above.

I am exploring this topic much more carefully in another work in progress, focusing on a number of policies that have a documented negative effect on abortion access. If the results continue to suggest a positive relationship between suicide and policies that actually inhibit (as opposed to merely delay) access to abortion, the question arises as to what light this sheds on other work that appears to find a positive association between abortion and suicide.

The most prominent of these studies was done by Mika Gissler and colleagues who examined data from the Finish Hospital Discharge Registry.<sup>43</sup> They found that there were 5.9 suicides per 100,000 women giving birth during the period 1987-1994.<sup>44</sup> This compares favorably to the rate of suicide among the general population of women which was 11.3 per 100,000 women in the population.<sup>45</sup> For those women who miscarried their pregnancy, the suicide rate was 18.1 per 100,000 women who miscarried.<sup>46</sup> Lastly, they found that ending a pregnancy through an induced abortion was associated with a suicide rate of 34.7 per 100,000 women who received abortions.<sup>47</sup> This increased risk of suicide was found throughout the various age groups.<sup>48</sup>

These results led the researchers to propose two competing hypotheses about the causal mechanism relating abortion to suicide. They posit that either abortion generates harmful effects for a woman's mental health or there are common unobserved characteris-

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22, at 1030.

<sup>42</sup> See, e.g., Phillip B. Levine et al., *The Effect of Medicaid Abortion Funding Restrictions on Abortions, Pregnancies and Births*, 15 J. HEALTH ECON. 555, 555 (1996).

<sup>43</sup> Gissler et al., *supra* note 17, at 1431.

<sup>44</sup> *Id.* at 1432.

<sup>45</sup> *Id.* at 1431.

<sup>46</sup> *Id.* at 1432.

<sup>47</sup> *Id.*

<sup>48</sup> *Id.*

tics or risk factors that lead a woman to end her pregnancy in abortion and also lead her to commit suicide.<sup>49</sup>

While my results are still preliminary, they would seem to support the self-selection hypothesis more strongly than the adverse effects hypothesis. Medicaid funding restrictions represent an exogenous shock to abortion access that is largely unrelated to any of an individual's unobserved risk factors, allowing us to approximate the kind of random assignment to abortion that would be necessary to rule out the self-selection problem. To the extent that the Medicaid funding restriction coefficients hold up in my continuing research, they would suggest that after one controls for the common risk factors that contribute to an individual's propensity to have an abortion and to commit suicide, the causal effect of abortion and suicide is actually negative. That is, it would seem that, at least for the relatively poor, limiting the option for abortion increases the likelihood of suicide. This is consistent with the Gissler study which found an increased incidence of suicide among poor mothers who carried their babies to term. Presumably, people in this economic group on the margin are ill-equipped to deal with the burdens that come with caring for a baby, leading to increased stress and depression.

To the extent that there is any positive association between abortion and suicide, independent of the self-selection effect, my results on the effect of mandatory waiting periods suggest that regret over a hastily made decision to abort could be at the root of the association. Thus, interventions that inform and counsel a pregnant mother regarding the resolution of her unplanned pregnancy could significantly improve the welfare of women. The reduction in suicides represents only a lower bound of the benefits of these interventions, since presumably there are a number of women in this situation who have regret and suffer depression because of it without rising to the suicide threshold. Waiting periods and counseling would likely benefit these individuals too.

## VI. EXTENSIONS

As discussed above, I am currently developing an expanded analysis of the effect of abortion restrictions on female suicide rates. Of particular interest, in the context of the results presented here, is an analysis of whether waiting periods lead to significant changes in abortion rates. If, as many pro-abortion rights groups claim, waiting periods deter very few women from having abortions, this would sug-

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<sup>49</sup> *Id.* at 1431, 1433-34.



gest that the effect identified here is entirely due to women feeling more comfortable about their decisions to abort, leading to less regret and attendant depression. On the other hand, if the assertion about the relationship between waiting periods and abortion rates is not supported by the data, and the adoption of waiting periods does systematically reduce the abortion rate, it might suggest that abortion does lead to adverse effects for some women, leading to mental illness and eventual suicide.

Such a result would be hard to square with the coefficients estimated here for the effect of Medicaid funding restrictions, assuming they hold up. Perhaps there is a heterogeneity of effects in which, for poor women, the burden of an unwanted child dominates the regret effect and greater abortion access is more favorable for mental health, while for more affluent women, the regret effect tends to dominate, implying that waiting periods and counseling will be welfare-improving for individuals from this segment of society.

In addition to examining the Medicaid funding restrictions more carefully and investigating the effect of waiting periods on abortion rates, I also plan to examine these issues for teenagers specifically. The Gissler study suggests that teens suffer pronounced increases in suicide incidence both when they have an abortion and when they carry a child to term (interestingly, they are the only age group that exhibits the latter effect). Further, we might think that teens are particularly susceptible to making rash decisions and thus could especially benefit from waiting periods. Also, with teens, I can exploit an additional public policy that affects abortion access, namely parental involvement laws, which have large effects on the abortion rates of teens.<sup>50</sup>

## CONCLUSION

Debates over abortion policy have not grown any more conciliatory in the three decades since the Supreme Court decided *Roe v. Wade*.<sup>51</sup> In recent confirmation hearings, Judge John Roberts was questioned repeatedly about his views on a woman's right to abortion.<sup>52</sup> Groups favoring abortion rights undertook large campaigns to

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<sup>50</sup> See Bitler & Zavodny, *supra* note 22.

<sup>51</sup> *Roe v. Wade*, 410 U.S. 113 (1973).

<sup>52</sup> *Confirmation Hearing on the Nomination of John G. Roberts, Jr. To Be Chief Justice of the United States Before the Comm. on the Judiciary*, 109th Cong. 27-28, 37, 47, 142, 145, 160, 186, 206, 224-25, 237-38, 255, 268, 284, 289, 290, 295, 299, 325, 381, 393, 401, 476, 521, 525, 537-39, 541 (2005), available at <http://frwebgate.access.gpo.gov>.

undercut the Roberts nomination because their members believe Roberts harbors pro-life sympathies and a disdain for the jurisprudential foundations of *Roe*.<sup>53</sup>

In society at large, though Americans favor keeping abortion legal by a slight majority, large majorities of people support some or all of the various restrictions states have placed on abortion access, including parental involvement laws, Medicaid funding restrictions, and pre-abortion waiting periods and counseling. Although most individuals decide their positions on these various matters on the basis of normative principles, these various policies have the potential to generate significant welfare effects on a number of different dimensions.

Empirical examination of these welfare effects is important to inform state abortion policy, particularly given the divisions that exist among voters on the basic normative principles. If there is no normative consensus, presumably consequentialist concerns can break the deadlock. Social scientists have weighed in on a host of the policy implications of abortion access, ranging from crime to sexually transmitted diseases, fertility trends, and child abuse. We know much more about the social effects of abortion than we did ten years ago, and hopefully researchers will continue in this vein.

This paper attempts to make progress on one dimension of the consequences of changes in abortion access. I examine the relationship between the adoption of mandatory waiting periods before which an abortion can be secured and the mental health of women seeking abortions. I find that the adoption of mandatory waiting periods reduces female suicide rates anywhere between 10 and 30 percent. This effect is statistically significant and robust to a range of controls for simultaneity bias, including the use of state-specific trends and instrumental variables analysis.

It would appear as though waiting periods (and the counseling that usually accompanies them) induce a more reasoned approach to the abortion decision, avoiding rash decisions on the part of the pregnant women. Better decision-making processes presumably lead to fewer regrets later on, lowering the incidence of depression and, ultimately, suicide. These results suggest mandatory waiting periods represent public policies that generate large welfare gains for women faced with unwanted pregnancies.

Although the relationship is not investigated as rigorously here, it also appears as though restricting Medicaid funding for abortions

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<sup>53</sup> See, e.g., Mark Memmott, *Special Interests Gear Up for Fight on Court Vacancy*, USA Today, Sept. 6, 2005, at 16A; and Jill Zuckman & Frank James, *Judge Meets His Jury on Capitol Hill*, CHIC. TRIB., July 21, 2005, at 14.

leads to an increase in female suicide rates. It would seem that funding restrictions lower the access one has to abortion services, leading women to bear the burdens of childbirth and child rearing for which they may not be ready. This apparently leads to increases in stress levels and eventually a rising suicide rate.

This latter result suggests previous research that identified a positive relationship between abortion and suicide might have suffered from self selection problems to the extent that similar characteristics lead a woman to both have an abortion and to commit suicide. If self-selection does not completely explain this empirical finding, then it might be the case that the relationship differs by socio-economic class, with abortion access restrictions leading to improved mental health for wealthier women and worsened mental health for poor women. This demands further research.