Utilization of Infertility Treatments: The Effects of Insurance Mandates [⊗]

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Abstract

Over the last several decades, both delay of childbearing and fertility problems have become increasingly common among women in developed countries. At the same time, technological changes have made many more options available to individuals experiencing fertility problems. However, these technologies are expensive, and only 25% of health insurance plans in the United States cover infertility treatment. As a result of these high costs, legislation has been passed in 15 states that mandates insurance coverage of infertility treatment in private insurance plans. In this paper, we examine whether mandated insurance coverage for infertility treatment affects utilization for a specific subgroup in the population: older, highly-educated women. These women are both at high risk for fertility problems, and have high rates of private health insurance coverage in plans likely to be affected by the mandates. We find robust evidence that while an effect of the mandates on utilization can not be detected for the full population of women, the mandates do have a large and significant effect on utilization for exactly this subgroup. These effects are largest for use of ovulation-inducing drugs and artificial insemination.

I. Introduction

Over the last several decades, delay of childbearing among women in developed countries has become increasingly common. At the same time, the number and share of women experiencing fertility problems have also increased. In 2002, fertility problems affected 7.9 million women in the United States, and the rate of such problems among women 15–44 had increased 44% since 1982 (Chandra and Stephen, 2005). Technological changes have made many more options available to individuals experiencing fertility problems. These advancements have enabled many women to conceive and deliver their own biological children. However, these technologies are expensive, and only 25% of health care plans in the United States cover infertility treatment (William M. Mercer, 1997).[1]

As a result of these high costs, legislation has been introduced at both the federal and state levels that would mandate coverage of infertility treatment by private insurers. As of 2009, fifteen states have enacted some form of infertility insurance mandate, and additional states have ongoing legislative advocacy efforts in this area. Much of the rhetoric from supporters surrounding passage of the mandates focuses on expanding access to those who would not be able to afford treatment otherwise.[2] On the other hand, opponents argue that these mandates and other health insurance regulations force insurers to offer benefits for services that people might not want or be able to afford, suggesting that mandates like these may not lead to increases in utilization, and perhaps might have other adverse effects. Given the continued interest in these

[1] While not all fertility treatments are expensive, in general the less expensive treatments are more likely to be covered by health insurance in the absence of mandates.
[2] For example, RESOLVE, the national infertility organization, says on their website "RESOLVE endorses state and federal legislation that will require insurers to cover the costs of appropriate medical treatment. RESOLVE believes the option to pursue medical treatment for infertility must be available to all those who need treatment, not solely those with the resources to pay for the treatment out of pocket" (www.resolve.org). In an article about the passage of the New Jersey mandate in 2001, State Senator Diane B. Allen, a sponsor of the bill, was quoted as saying "[C]ouples who are infertile and can't afford these things on their own have been treated extremely unfairly" (*New York Times*, 2001).

types of mandates by policy-makers as well as the current focus on health care reform, understanding whether these types of private insurance market regulations affect utilization of health care services, and if so, for whom, is critical.[3]

In this paper, we use data from the National Survey of Family Growth (NSFG) to examine whether infertility insurance mandates affect utilization for a specific subgroup in the population: those women who are both likely to be at high risk for fertility problems and who are likely to have high rates of coverage by insurance plans to which the mandates apply – older, more-educated women. Our research uses panel data techniques and focuses on the use of treatments at the population level, and can therefore produces estimates of the effect of mandates on the utilization of treatments by all women, not just those whose treatments result in live births. In addition, we can examine effects on a wide range of types of infertility treatments which can not be studied in most other data sets.

We find robust evidence that the mandates have a large and significant effect on utilization of infertility treatment for exactly this subgroup. An infertility insurance mandate is associated with a 24% increase in the probability that an older, educated woman reported receiving medical help to get pregnant. In addition, the pattern of results confirms expectations about the types of treatments that should be impacted: relatively expensive treatments that would be more difficult to pay for out of pocket. Specifically, we find that mandates lead to statistically significant and relatively large increases in the use of ovulation-inducing drugs and artificial insemination. However, not all of these treatments will ultimately lead to live births. Of older, more-educated women in the 1995 and 2002 NSFGs who ever used ovulation-inducing drugs, about 25% never had a live birth, and about 40% of these older, educated women who had

[3] A number of papers (Buckles, 2006; Schmidt, 2007; Bitler, 2008; and Bundorf et al., 2008) have illustrated an effect of these mandates on births or birth outcomes, suggesting that there is likely to be a utilization effect as well. We discuss these papers in detail in Section III.

artificial insemination never had a live birth. While some of the women with no live births are undoubtedly still undergoing infertility treatments, this provides a possible upper bound for the share of these treatments which might not result in a live birth. These results suggest that private insurance regulations requiring that insurers cover specific treatments have the ability to alter utilization in the context of infertility treatment, but that these utilization effects can only be detected for one subgroup of women who are both at high risk of needing the treatment and who are privately insured at high rates: older, more-educated women.

II. Mandated Insurance Benefits

Over the past 30 years, state-level mandated health insurance benefits have grown in popularity as a means of trying to regulate the private health care system. Currently, well over 1,000 state mandated benefits are in effect (EBRI, 2005). These laws require the coverage of specific health services or coverage of the services provided by specific types of providers. Advocates of the laws appeal to unmet need, while opponents argue that such laws force firms to buy coverage for services their employees don't want, potentially leading to higher rates of uninsurance.

The primary economic efficiency argument in favor of mandated benefits for specific illnesses and conditions relies on asymmetric information between patients, insurers, and firms. If such asymmetric information exists, this could lead to adverse selection in the health insurance market (e.g., Rothschild and Stiglitz, 1976). Mandates could also cause detrimental effects, if mandating benefits reduces employment or health insurance coverage.[4] However, additional research on the effects of mandates on health insurance coverage (Gruber, 1994) and labor market outcomes (Kaestner and Simon, 2002) finds little effect overall.

[4] Effects on health insurance coverage could result either from reduced offering of insurance or reduced take-up.

Proponents of mandated insurance benefits aim to affect utilization of health services and, ultimately, health outcomes. However, recent evidence on the effects of mandates is mixed, suggesting that mandates may increase utilization for some groups, but have little impact on other outcomes. Bao and Sturm (2004) and Pacula and Sturm (2000) find no significant effects of mental health parity legislation (considered to be a "high-cost" mandate) on utilization of mental health services among the privately insured, but find some evidence that mandates increase utilization of services among those with poor mental health. Recent work on early postpartum discharge laws (Liu et al. 2004) finds a positive significant effect of these laws on length of hospital stays. Other work suggests that mandates for breast cancer screenings have lead to a significant increase in annual mammography rates (Bitler and Carpenter, 2009).

Several possible explanations have been considered for the lack of consistent effects found in much of the existing literature. First, state-level mandated benefits will not affect all individuals within a state. Mandates only apply to individuals (and their covered dependents) who have private insurance, and should only affect individuals employed by firms which do not already cover such benefits. In addition, the Employment Retirement Income Security Act of 1974 (ERISA) preempts specific state regulation of self-funded insurance plans provided by private-sector employers. As such, it is possible that legislation may not affect enough individuals to discern an impact if looking at the entire population. For example, Liu et al. (2004) find that the effect of drive-through delivery laws has been blunted by ERISA. Furthermore, many mandates potentially affect only a smaller subgroup of the population (for example, mental health mandates affect those in need of mental health services), and this may not be the same subgroup that has private insurance. Even if the subgroup consists of individuals who are privately insured at high rates, if they are a small share of the population or if the effect for them is small, it might be easy to conclude that the overall policy had little or no significant effect from regressions which constrain the policy to have the same effect for the full population.[5]

Second, it has been suggested that perhaps state mandate laws are not binding (Gruber 1994). Some evidence suggests that benefits are similar in firms in states that mandate relative to firms in states that do not mandate, as well as in firms that self-insure relative to firms that are fully-insured within mandate states (Acs et al. 1996, Gruber 1994, Jensen et al. 1998), although much of this evidence is dated or relies on employee rather than firm data. However, this is not usually the case for infertility treatment, which is rarely covered in the absence of mandates.

Firms may also manipulate the combination of benefits and wages they offer to attract or retain particular types of employees (e.g., Gelbach, Klick, and Wexler, forthcoming; Oyer, forthcoming). For example, if being an employee who values infertility treatment is positively correlated with productivity, then even self-insured firms may choose to offer their employees insurance coverage which includes infertility benefits. If mandates do not affect the benefits offered by firms, then they would not be expected to affect utilization of services or health outcomes unless they resulted in premium changes that altered take-up decisions. Finally, there are political economy issues associated with the passage of mandates. If employers do not expect a mandate to have a large impact on health care utilization and costs, they are less likely to oppose the legislation (Bao and Sturm, 2004). Overall, the theoretical predictions and empirical findings from previous work are mixed; thus it is an empirical question whether infertility insurance mandates will have real effects on utilization of services.

[5] Intuitively, if the effect of the policy is small for the relevant group relative to the residual variance and zero (or close to zero) elsewhere, or if the subgroup is small, a test for an overall policy effect is more likely than a test for a policy effect which is subgroup specific to fail to reject a null of zero effect.

III. Infertility Treatment and Infertility Insurance Mandates

In order to understand the potential effects of infertility insurance mandates, it is necessary to understand infertility and its treatment. Today, treatment for infertility tends to follow a hierarchical progression, although not all couples progress neatly through all stages of treatment. In general, the first stage of treatment is a diagnostic workup, involving a thorough examination of each partner's reproductive organs and their circulatory, endocrine, and necrologic functions. Couples who initiate treatment begin at Level I, which involves initial ovarian stimulation with clomiphene citrate for up to 6 cycles (taking at least 6 months). Level II involves the use of exogenous gonadotrophins (another drug used to stimulate ovulation), with or without intrauterine insemination (IUI), for up to 6 cycles, and Level III involves assisted reproductive technologies such as *in vitro* fertilization (IVF), for up to 4 or more cycles. As a result, many but not all couples who reach Level III will also have received Level I and II treatments along the way.[6] Of couples who begin treatment, over 80% of those who proceed through all the steps are likely to conceive (Gleicher, 2000). Even for couples who are successful with their first cycle of IVF, the process can take 2–3 years.

Infertility services can be quite expensive and are not covered by many insurance plans. Hormone therapy can range from $200–$3,000 per cycle. Tubal surgery can range from $10,000–$15,000, requires a hospital stay, and poses a high risk of complication (RESOLVE, 2003). The average cost of an IVF cycle in the United States is $12,400 (ASRM, 2003), and Neumann, Gharib, and Weinstein (1994) calculate that the cost of a successful delivery through

[6] This progression is also evident in data from the National Survey of Family Growth. For example, of the women in the NSFG who reported receiving IVF, about 80% reported receiving male and female testing, 65% also received ovulation-inducing drugs, and 46% also reported artificial insemination. These and other numbers are reported in Table 2, and discussed in greater detail in Section IV.

IVF ranged from $44,000 to $211,940 in 1992 dollars, depending on the cause of infertility, the mother's age, and other factors.

As a result of these high costs, one way in which access to infertility treatments has been expanded in the United States is through legislative action. The first state-level infertility insurance mandate was enacted by West Virginia in 1977. Since that time, fourteen other states have passed mandates, and additional states have ongoing legislative advocacy efforts in this area. Table 1 contains a list of states that have passed mandates, along with the year the mandate passed, and shows that there is considerable variation in both the timing of the mandates and in the types of states that have passed mandates; with the list including both small and large states, as well as states from all U.S. regions. Some mandates are mandates "to cover," and require that health insurance companies provide coverage of infertility treatment as a benefit included in every policy. Less commonly, states have enacted mandates "to offer," and require only that health insurance companies make available for purchase policies that cover infertility treatment. Finally, some mandates exclude coverage of IVF.[7] While only fifteen states have mandates in place during our sample period, these mandates were enacted in a number of large states and therefore affect an increasingly large fraction of the population. In 1981, less than one percent of the population resided in a state affected by the mandates, compared to 47.2% in 2003.

Previous research has examined the impacts of these insurance mandates on fertility. Schmidt (2007) uses Vital Statistics Detail Natality Data (DND) and Census population counts to examine the effects of the mandates on first birth rates, and finds that mandates increase first birth rates among older women by 19 percent. Buckles (2006) uses the DND and finds that the insurance mandates have increased the number of children per birth. Bitler (2008) uses the DND and finds an increase in the probability that infants born to older mothers are twins, and a larger

[7] For additional detail on the mandates, see Schmidt (2005).

increase in the probability that they are mixed-sex twins. Bundorf et al. (2007) use the DND and provide evidence of an increase in deliveries and an increase in multiple births for older women. This previous literature has focused on older women in states with mandates, in part because they are more likely to be infertile and demand treatment and in part because any mandate effects operating through private insurance markets must affect women who are privately insured at high rates.[8]

These papers provide consistent evidence that the infertility mandates have had significant fertility effects for older women. This implies that the mandates have had utilization effects as well. However, examining these utilization effects directly is important for a number of reasons. First, it would allow confirmation of the previously discovered fertility effects with a different data source. More importantly, examining utilization effects could provide information on the types of treatment that women receive. Some treatments are relatively high cost, while others are less expensive. Some are more likely to be used by the women with the lowest fecundity (e.g., IVF) while others may be used more broadly. Mandates could also cause women to progress through the levels of treatment more quickly than they would if they faced expenses out of pocket. Answering these questions is an important step towards understanding the relevant costs and benefits of the insurance mandates. Finally, studying the effects of the

[8] An alternative possibility is that the mandates could have a larger impact for younger than older women (conditional on needing treatment), as older women are more likely to be higher income and therefore presumably have lower price elasticities of demand. Chambers et al. (2009) reports price elasticities of demand for IVF from developed countries, but does not calculate the elasticities by age or education. However, at the same time, younger women face a longer time frame before they become unable to have a child for biological reasons after menopause, and also may be less likely to be aware of their possible impaired fecundity. In addition, for two women with the same biological ability to have children at each age, the younger woman will still be less likely than older woman to have difficulty conceiving because of the age related decline in fecundity.

mandates on utilization provides information on use of treatments that do not result in live births, which would be undetectable using birth records such as the Detailed Natality Data.[9]

The majority of the previous work on the impacts of the mandates on utilization of services has focused on a single measure of utilization — cycles of assisted reproductive technologies (ARTs) (e.g., Jain et al., 2002; Hamilton and McManus, 2004; Bundorf et al., 2008; Henne and Bundorf, 2008; Bundorf et al., 2009).[10] ARTs include all procedures that combine egg and sperm outside the body, such as IVF. These papers use data from a combination of two sources: Congressionally mandated clinic reports of success rates for ART cycles, and reports of such treatments collected by the American Society for Reproductive Medicine (ASRM), a provider group. These papers find consistent evidence that mandates are associated with increased rates of IVF utilization. However, unfortunately these data have two important limitations. First, when these two data sources are combined, they only extend back to 1987 or so, a period after many of the mandates were enacted. These papers therefore cannot use pre-mandate data on utilization and therefore cannot control for unobserved differences in utilization across states that may be correlated with but not caused by the mandates. In addition, these studies must limit their analyses to ART procedures. Despite being very expensive, these ARTs comprise only 5% of all infertility treatments (ASRM, 2003). In our own NSFG data, only 2 percent of women reporting any infertility treatment reported using IVF.

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[9] Data on timing of the first fertility visit is only available for the 1995 and 2002 NSFGs. Fully 30% of all women who ever used ovulation-inducing drugs, 42 percent of women who used artificial insemination, and 54% of women who ever used IVF have never had a live birth. While some share of these women are likely still getting treatment, others most likely have been unable to conceive or carry a live birth to term even with the help of treatment, suggesting that a large share of potential treatments might be missed in data that only looks at live births. If we limit this calculation to those women who had no first birth after their first infertility treatment and have not had a visit for infertility treatment in the past year, assuming that these women might be the most likely to have given up trying to conceive, we see that 15% of those getting any medical help to get pregnant, 16% of those who took ovulation-inducing drugs, and 20% of those getting insemination fall into this category.

[10] One exception is a recent paper by Mookim et al. (2008). They use claims data from a set of large firms from 2001–2004 to look at a variety of treatment uses and their impact on outcomes. While they too capture a large set of treatments, as with the papers on use of ART, their data are from a post-mandate period for most states.

In earlier work, Bitler and Schmidt (2006) use the National Survey of Family Growth to examine racial, ethnic, and socioeconomic disparities in infertility and in utilization of infertility treatment. This paper finds that fertility problems are more likely among non-white and less-educated women, but that infertility treatment is utilized much more heavily by white and college-educated women. The paper then looks at the insurance mandates, and finds no evidence that they have mitigated these racial, ethnic, or socioeconomic disparities in utilization of infertility treatment. In fact, Bitler and Schmidt (2006) finds no effect of these mandates on utilization of infertility services for the overall population of women aged 15–44, or for a subgroup of college-educated women or older women or white women. They do report that a model with a three-way interaction between high education, any mandate, and age at least 30 leads to a statistically significant marginal effect on any use of infertility treatment or medical help to prevent miscarriage of 4.6 percentage points. However, this result is included only to bolster an argument about power for explaining disparities and not explored in any detail.

In this paper, we use the National Survey of Family Growth to comprehensively explore utilization effects of the infertility insurance mandates. The timing of the NSFG includes years spanning the passage of the infertility mandates, and therefore allows us to control for unobservable differences in utilization across years that are constant over time. We replicate the result of Bitler and Schmidt (2006) – that older, more-educated women exhibit an increase in utilization as a result of the mandates. We then use the rich detail on types of infertility treatments available in the NSFG to examine the robustness of these findings. First, we look at whether mandates primarily affect use of medical help to get pregnant versus use of medical help to prevent miscarriage. Mandates should have a larger impact on the use of medical help to get pregnant, and should have only indirect effects on the use of medical help to prevent miscarriage, which were likely covered by existing insurance. These indirect effects could result if mandates induce greater use of treatments among women who after treatment become pregnant and then later miscarry. Then, we look at the association between the mandates and the use of specific treatments that are costly and might plausibly be affected by the mandates The NSFG provides information on a wide set of possible treatments, so we are able to examine a wider range of specific infertility treatments than are available in most other data sets.

There are two reasons to expect effects for this particular subgroup of older, highly-educated women. The first is related to demand for treatment. In order to desire treatment for infertility, one has to seek to become pregnant and be unsuccessful.[11] Over the last several decades, increases in female labor force participation and educational attainment have been accompanied by delays in childbearing.[12] The average age at first birth has risen from 21 years in 1970 to 25 in 2000 (Mathews and Hamilton, 2002), and differences in age at first birth by educational category have been even more striking. College-educated women are more likely to delay, perhaps in part to reduce the motherhood wage penalty associated with childbearing (e.g., Blackburn et al., 1993; Miller, 2008). As women wait longer before attempting to have children, the age at which women's fertility problems are first discovered will rise.

In addition, according to the clinical and demographic literature, age is independently associated with difficulty conceiving and carrying a pregnancy to term (Menken, 1985; Weinstein et al., 1990). Older women are significantly more likely to experience fertility problems and to seek help for these problems (Stephen and Chandra, 2000; Wright, Schieve,

[11] Medically, one is defined to be infertile after one year of unsuccessful efforts to become pregnant if the woman is under 35, or six months of unsuccessful efforts if 35 or older.

[12] These delays in childbearing depend upon the ability of women to effectively control their fertility through contraception and or abortion (e.g.; Goldin and Katz, 2002; Bailey, 2006; Ananat, Gruber, and Levine, 2007; and Guldi, 2008).

Reynolds, and Jeng, 2003). For example, in 2002, women 30 and older accounted for almost 89% of all assisted reproductive technology procedures performed in the United States.

The second reason to expect any effects to be concentrated among older, highly-educated women is that these state-level mandates generally only legally apply to persons with private health insurance.[13] Our own estimates from 2003 Medical Expenditure Panel Survey data suggest that 14–19% of private sector employees enrolled in employer-provided insurance in the U.S. were in firms to which these infertility insurance mandates applied (firms with at least one non-self insured plan) (derived from AHRQ 2005). Older, highly-educated women are more likely to have private coverage (through their own employer, or a spouse's employer, or an individual plan) than are other women. During calendar year 2002, 85% of women 30 and older with some college were covered by a private health insurance plan, while only 64% of women with at most a high school degree had such coverage.[14, 15] We expect the effects to be largest and relatively concentrated among this subgroup of older, highly-educated women in states with mandates. Mean reports of ever having had any medical help to get pregnant (reported in Table 3 and discussed below) support this prediction, with rates for older women with some college being 1.5 times as large as for older women with no college (0.168 versus 0.112) and 3.5 times as large as for younger women (0.168 versus 0.048). As a result, we implement a differences-

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[13] However, since ERISA exempts self-insured plans, having private insurance is a necessary but not sufficient condition for having mandate affect one's coverage of infertility treatment. Unfortunately, no publicly available data allow us to test whether older, educated women are more likely than younger or less-educated women to have private insurance from a plan that does not self-insure. A recent article using firm based data suggests that about 50 percent of covered workers in 2001 were in plans that were self-insured, and that this number had declined slightly since 1993 (Gabel, Jensen, and Hawkins, 2003).

[14] These numbers are derived from authors' tabulations from the 2003 March Current Population Survey.

[15] This same group of women is also likely to have higher levels of income with which they could presumably pay for infertility treatments out of pocket. However, the median family income for white women with at least some college education in 2001 was approximately $58,000, which likely would not easily enable a family to pay for infertility treatments out-of-pocket, given estimates that suggest that the median cost per live delivery resulting from IVF is $56,419 (Collins, 2001). More recent estimates from a comparison of developed countries suggest that the gross cost of a single IVF cycle as a percent of annual disposable income was highest in the United States, at 50%, compared to 12% in Japan (Chambers et al., 2009).

in-differences-in-differences-like (DDD-like) strategy, focusing attention on the effects of the mandates among highly-educated older women.[16]

IV. Methodology and Data

We pool individual-level data from the 1982, 1988, 1995, and 2002 rounds of the NSFG to see whether utilization of infertility treatment is heavier in states with infertility insurance mandates. Each wave of the NSFG surveys a nationally representative sample of women aged 15–44 on their fertility and marital histories. The NSFG is the only nationally representative source of individual-level data that asks detailed questions on infertility treatment, and the only publicly available source of data that provides information on infertility treatments that do not involve ARTs.[17,18] It allows us to examine changes in utilization of treatments that do not result in live births. In addition, it is the only data set with information on infertility treatments that spans the years both before and after the mandates were passed, which is essential when trying to control for unobservable state differences in treatment propensities. We merge information on state infertility insurance mandates to the NSFG data.

Our first dependent variable of interest for this analysis is an indicator for whether the woman has ever obtained infertility treatment. Women are coded in the NSFG as having ever obtained infertility treatment if they reported either having obtained medical help to get pregnant or having obtained medical help to avoid a miscarriage (or both). We first look at the aggregate

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[16] We term this a DDD-like strategy because we cannot rule out that some effects happen to younger or less-educated women. If the effects are only positive for the highly-educated older subgroup and zero (or close to zero) elsewhere, we would have a true DDD setting; a situation such as this could explain the non-findings for the effects of mandates for all older women in Bitler and Schmidt (2006).
[17] Claims data such as that used by Mookim et al. 2008 also have data on various treatments, but only for women with insurance that reimburses them for it. Such data are also not publicly available for a period pre-mandates as far as we know.
[18] In 2002, the NSFG asked male respondents about their use of infertility treatment for the first time. We do not analyze these data in this paper. However, Anderson et al. (2009) report that 7.5% of all sexually-experienced men in the 2002 NSFG reported a visit for help with having a child.

variable, but we then break it out into the two components, since we expect insurance mandates to affect the two variables differently. If there are utilization responses that are clearly due to the mandates, we would expect them to affect use of medical help to get pregnant more than use of medical help to prevent miscarriage (which was likely to be covered in the absence of a mandate, and should only indirectly respond to the mandates).

We then decompose the "obtained any medical help to get pregnant" variable by *type* of treatment. This category includes some relatively costly therapies that are almost exclusively used for infertility treatment — ovulation-inducing drugs, artificial insemination, and IVF; but it also includes other medical procedures that are less expensive or might plausibly have been covered without mandates (these include testing of the respondent or her partner, surgery for blocked tubes, and "other treatment" (which varies by year of the survey but includes treatment for endometriosis or fibroids, advice, and "other treatment not listed" categories)). At least one of these other procedures, tubal surgery, is increasingly considered by the medical profession to be a less attractive substitute for IVF (Gocial, 1995; Practice Committee of the American Society of Reproductive Medicine, 2008). Other evidence suggests that even in the absence of insurance coverage for infertility treatment, treatments may be paid for by insurers under alternate billing codes (Blackwell and Mercer, 2000; Jones and Allen, 2009). We expect the mandates to increase use of ovulation-inducing drugs, artificial insemination, and IVF more than they increase use of the other therapies both because these are more expensive and because these are harder to surreptitiously bill for in the absence of insurance coverage for infertility treatment. However, it is likely that capturing effects on IVF will be challenging in a woman-based sample like the NSFG due to sample size – only 0.2 of a percent of the women in all waves of the NSFG report receiving *in vitro* fertilization.

Many of these women are obtaining more than one treatment, as one might guess from the hierarchical nature of the typical treatment ladder discussed in Section III. This use of multiple treatments is reported in Table 2. Panel A of Table 2 shows the who reported receiving each of the specific types of infertility treatments (Columns 1-6), or who got some other treatment (Column 7), first as a share of all women, and then as a share of all women who received medical help to get pregnant. Column 8 reports a residual "other treatment" variable for women who reported medical help to get pregnant but did not receive any of the treatments listed in Columns 1–6, and this residual "other treatment" variable is the one we report regression results for. For women receiving the specific treatments listed in each column, Panel B reports the share also receiving the other treatments listed by row. For example, Column 1 indicates that among women who used ovulation-inducing drugs, 17% also had artificial insemination, 3% had IVF, 62% had the woman tested and 52% had the man tested, 18% had tubal surgery, and 69% had some other treatment. Among women who had artificial insemination, 10% had IVF, 71% ovulation-inducing drugs, 85% had the woman tested, 75% had the man tested, and 78% had some other treatment. The overlap of treatments suggests that we might observe increases among all treatments, even those which might plausibly have been paid for in part by insurance which did not include infertility treatment (e.g., see Blackwell and Mercer, 2000; Jones and Allen, 2009). This is what motivates our definition of the residual "other treatment" variable mentioned above, which is the one we use in our regression analysis. This variable might plausibly be affected less by the mandates than the other types of treatments.

One potential issue with the outcome measures used here relates to the distinction between stocks and flows. Conceptually, we would like to measure the effect of the mandates on the likelihood that a woman utilizes infertility treatment in a given year. However, the variables we are using examine whether the respondent has *ever* received infertility treatment, and therefore measure the stock of women who have received treatment. Even if mandates affect the number of women who receive treatment in a given year, the stock of women who have ever received treatment may be changing much more slowly. This suggests both that the true effects of the mandates on contemporaneous use of treatments may be larger than the estimates presented below, and that our power to find significant effects may be reduced. On the other hand, since we do not have annual data, the use of a stock measure may help us detect effects; if a state passed the mandate between waves of the NSFG, we will be able to see impacts of the mandate on the ever had treatment variable that accumulate during the intervening years. Despite these possible limitations, our analysis using these population data is useful, since it allows us to learn more about the extent to which these mandates affect use of all treatments, and is not limited to counts of cycles of the most expensive ARTs.

Table 3 contains summary statistics for our treatment variables for all women, as well as broken out by age group (under 30 versus 30 and older) by completed education (no college versus at least some college). While about 10% of women 15–44 have ever obtained medical help to get pregnant, this varies dramatically by age and educational status. Only about 5% of women under 30 have obtained such treatment, while 11.2% of women 30 and older with no college and 16.8% of women 30 and older with some college have obtained such treatment. These patterns hold for the aggregate "had treatment to help get pregnant" variable and virtually every individual type of infertility treatment.[19] Older women with at least some college are 3.5 times as likely as women under 30 with some college to have received medical help to try to get pregnant (16.8% versus 4.8%). They are about five times as likely as younger women to have

[19] This is less so for the catchall category "other treatment." Older, highly-educated women are only 2.4 times as likely as the younger women to report this (5.5% versus 2.3%).

been treated with ovulation-inducing drugs (6.5% versus 1.4%), nine to nineteen times more likely to report artificial insemination (1.9% versus 0.1% or 0.2%), and twenty-four times more likely to report in vitro fertilization (0.49% versus 0.02%).[20] The differences in use by education category among the older women are still large, although not as dramatic as the differences discussed above. Older women with more education were 1.9 times as likely as older women with less education to have ovulation-inducing drugs, testing of the female, or testing of the male; 2.4 times as likely to have insemination; and 6.1 times as likely to have IVF.

Next we turn from the simple means to multivariate regressions. We estimate linear probability models of the form[21]:

$$\begin{aligned}
&treatment_{ist} = \alpha + \beta_1 mandate_{st} + \beta_2 (age30+)_{ist} + \beta_3 somecoll_{ist} \\
&+\beta_4 (mandate_{st} \times age30+_{ist}) + \beta_5 (mandate_{st} \times somecoll_{ist}) \\
&+\beta_6 (age30+_{ist} \times somecoll_{ist}) + \beta_7 (mandate_{st} \times age30+_{ist} \times somecoll_{ist}) \\
&+X_{ist}\delta + Z_{st}\lambda + \gamma_s + \nu_t + \varepsilon_{ist}
\end{aligned}$$

Treatment represents the treatment categories reported by NSFG respondents and described earlier. We first look at whether a woman reports ever having infertility treatment. We then break this into two groups – those who report receiving any medical help to get pregnant, and those receiving any medical help to avoid a miscarriage. (Note that these two measures are not mutually exclusive.) We then analyze the types of treatment received, looking specifically at ovulation-inducing drugs, artificial insemination, IVF, male and female testing, tubal surgery, and other treatment to get pregnant.

[20] We have done simple *t*-tests for the equality of the means across group (high/low education by age 30 and older/age under 30) and reject for all of the outcomes we examine, with *p*-values all well below 0.01.

[21] All of our dependent variables are binary indicators, and some of their averages are small. One might be concerned about the use of least squares in this setting. We have verified that these results are robust to functional form by estimating the corresponding logistic regressions. Results are quite similar in both magnitude and statistical significance and are available from authors on request.

For the reasons outlined above, we expect that the mandates will have the largest impact on older, college-educated women, since they are the group at higher risk for fertility problems, and the group most likely to have private health insurance.[22,23] Thus, our key estimated effect, β_7, is the coefficient on the three-way interaction between the woman's state having an infertility insurance mandate, the woman's age being at least 30, and the woman having attained at least some college. We also control separately for mandate, age, and education effects, and all two-way interactions between mandate, age, and education. Our regressions include both state and year fixed effects. If the effects of the mandates on other groups were negligible, this would represent a true differences-in-differences-in-differences estimate. We will refer to this as a DDD-like estimate for ease of exposition.

However, the mandates may affect women in other groups. In fact, in some specifications, the mandates appear to have negative effects for some groups. In addition, the DDD-like estimation requires that all of our other control variables – including the state and year effects – have the same effect on utilization of infertility treatment for our older, college-educated women as they do for other groups of women, which may be an unrealistic restriction. Therefore, we also run regressions that are restricted to subgroups – first stratifying by education level, and then stratifying by age in order to see if we still estimate significant effects for the mandate interactions when the less-educated or younger group are excluded. The first analysis allows the effects of all coefficients to vary by education level, and the second allows the effects

[22] This group of highly-educated older women makes up about 28% of our sample or around 9,000 of the 30,149 women in our eventual sample, of whom only about 9% of our sample or about 2800 lived in states with an active mandate. It is likely that we would have been unable to detect significant effects with our DDD-like strategy without using all 4 waves of the NSFG. Further, without the 1982 data, we would have little or no pre-reform data for a number of the mandate-adopting states.

[23] We cannot observe private insurance coverage in all waves of our data and likely would not want to use it as a control in any case, as it could conceivably respond to the mandates.

to vary by age group.[24] Finally, we look to see if there are differences in utilization effects for cover versus offer states, and for IVF versus non-IVF mandates, with the expectation that the significant effects should be larger for cover relative to offer mandates and for IVF relative to no IVF states.[25]

We control for a number of individual-level characteristics, including age, race, ethnicity, educational attainment, and whether or not the woman lives in an urban area. We also control for a number of time-varying state-level characteristics, such as the share of the population that is black and the share Hispanic, the Medicaid eligibility threshold for a pregnant woman, the real maximum AFDC/TANF benefit for a family of four, real median income for a family of four, the unemployment rate, the employment growth rate, the share of the population under the Federal Poverty Level, and the share of births to unmarried women. These state-level controls have been found to be associated with fertility behavior in other work.

We weight the data to be population-representative, and we report heteroskedasticity robust standard errors clustered at the state level.[26] We estimate these regressions on the sample

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[24] We have run a variety of specifications with the mandates, and the main tables report only the DDD-like three way specifications. One concern might be pre-test bias or cherry-picking this subgroup to focus on based on the results of a large set of regressions. However, findings from the existing research on mandates and fertility described above logically suggest a focus on older women, and previous work on utilization using the NSFG by Bitler and Schmidt (2006) for the outcome "any use of infertility treatment (medical help to get pregnant or to avoid miscarriage)" suggests that it is not possible to uncover effects of the mandates for either the full population of women of child-bearing age, or for the group of all older women. As described above, both likely demand and differences in rates of private insurance suggest this focus on older, highly-educated women. We did run some specifications with mandates only, with age-mandate interactions, and with education-mandate interactions, generally finding positive but statistically insignificant effects on these variables.

[25] Previous work by Bundorf, Henne and Baker (2008) and others has focused primarily on categorizing mandates as "cover including IVF" and "cover excluding IVF." We do not use this as a primary specification due to concerns raised in a recent paper by Conley and Taber (forthcoming) about over-rejection in DD models with state level clustering when only a few states that change treatment status (only three states are cover excluding IVF states). We have estimated this as an alternate specification, and the results for ovulation-inducing drugs are significant for cover including IVF mandates, and slightly larger (0.03 versus 0.024) than the estimated effect for cover excluding IVF mandates.

[26] The NSFG is a complex sample survey. While all waves of the NSFG used were designed to provide data that was nationally representative of the US female population 15–44, there have been numerous changes in sample design over time. In particular, different surveys oversampled different groups (e.g., black women in all NSFG

of women who have had sex and are past menarche. We have also tested to see whether our results are driven by endogeneity of the passage of mandates by including leads of the mandate variables in our specifications; these leads are not statistically significant.

V. Results

Table 4 reports the OLS regression results for utilization of infertility treatment as a function of state-mandated infertility insurance. Column 1 replicates the findings of Bitler and Schmidt (2006) and presents results for whether the woman reported seeking any infertility treatment. These results show that the mandate itself has no statistically significant effect on reports of seeking medical help. However, the coefficient on the three-way interaction of mandate, age at least 30, and education at least some college is a positive 0.041, and is statistically significant at the 5% level. This suggests that for highly-educated older women, living in a mandate state is associated with a 4.1 percentage point increase in the probability of ever having had sought medical help to get pregnant or avoid miscarriage. The magnitude of this effect is large, given the pre-reform mean of around 15% percent of all women and 23% of more-educated women 30 and older in non-mandate states who ever sought such help. Effects that are large in magnitude may not be surprising given the high cost of many of these treatments. This finding suggests two things: first, that the mandates have a demographically substantial effect on utilization of infertility services; and second, that even mandates that have a large effect on a particular subgroup may have no discernable impact on the entire population.

We next break these results out between those who used medical help to get pregnant (Column 2), and those who used medical help to avoid miscarriage (Column 3). The entire

waves, but Hispanic women in only 1995 and 2002, and teen women in only 1982). As a result, we use the population weights provided by the NSFG to ensure the results are population representative.

effect found in Column 1 is due to those who received medical help to get pregnant – the estimated coefficient on the 3-way interaction is similar in both magnitude and statistical significance to the original coefficient. The estimated effect of the 3-way interaction on help to avoid miscarriage is much smaller in magnitude and not statistically different from zero. [27] Another way to get a sense of the magnitude of these effects is to normalize them by the baseline mean, which translates them into a percent increase from the baseline. The bottom two rows of the table report the baseline mean of the relevant dependent variable for more-educated women 30 and older in no mandate states and the three way interaction effect measured as a share of this baseline. This suggests that the estimated effects of the mandates on older, educated women are considerably larger as a share of the baseline for medical help to get pregnant (24%) compared to medical help to avoid miscarriage (8%). This is as expected – the miscarriage variable should respond only indirectly to the mandates (e.g., if women who use infertility treatment conceive but are more likely to miscarry), so any effect of infertility insurance mandates on the miscarriage help variable should be smaller in magnitude than the effect on help to get pregnant.

Some of the two-way mandate interactions in Column 2 (mandate × 30 and older, mandate × some college) are negative and statistically significant, which may be surprising, given that the mandate should lower costs for anyone affected by the mandate.[28] However, even a variable like "ever sought medical help to get pregnant" includes a wide variety of treatments, some of which may be less relevant in the presence of mandates (for example, tubal surgery). Thus, we also explore the use of specific treatments in Table 5.

[27] The magnitude of these coefficients is quite different as well. The effect on medical help to get pregnant is larger in magnitude, and the coefficient's 95% CI is [0.009, 0.072] which excludes the point estimate for medical help to prevent miscarriage. Similarly, the upper bound for the 95% CI for the miscarriage variable coefficient excludes the coefficient on help to get pregnant. We cannot perform a seemingly unrelated regression test, since women may report medical help to get pregnant or medical help to avoid miscarriage, or both.

[28] We also explore regressions restricted to age and education subgroups (reported in Tables 6 and 7), to be sure that our significant results are not being driven by these negative effects for some subgroups one might expect not to be affected. Results are discussed below.

In Table 5, we look separately at different types of infertility treatments: use of ovulation-inducing drugs, use of artificial insemination, use of IVF, testing (separately by testing of the female and of the male), tubal surgery, and some other treatment. Recall from Section III that most individuals who receive infertility proceed through a hierarchical process. Therefore, most individuals who receive ARTs like IVF will have already received lower level treatments such as ovulation-inducing drugs.[29] The estimated coefficient for β_7, our key variable of interest, is positive and statistically significant for the use of ovulation-inducing drugs, suggesting that mandates led to a 2 percentage point increase in use of these drugs for older women with some college. This coefficient is not statistically different from the coefficients on testing of either the male or female (neither of which is significant), which also suggest in each case an effect of the mandates among older college-educated women of nearly 2 percentage points. However, the effect of mandates on use of ovulation-inducing drugs for older, educated women is considerably larger as a share of pre-mandate use than the effect on testing. A 2 percentage point increase in use of ovulation-inducing drugs with mandates reflects a 32% increase from a baseline level of use of 6.2 percent of women 30 and older with some college, compared to a 24% increase in the use of testing for females or males from a baseline level of use of 7.5 percent for female testing or 6.8 percent for male testing. While not significant, the effect for artificial insemination is also positive and large as a share of the baseline. Use of IVF is not estimated to increase, but so few women report use of IVF in the NSFG that it would be surprising if we were able to discern any effects.

In addition, the mandates have a small negative effect on the probability that a woman reports tubal surgery (although this effect is not statistically different from zero). It is plausible

[29] As noted earlier and shown in Table 2, this is empirically the case in our data, as many who obtain one treatment get others as well.

that there could be little change in tubal surgeries. First, evidence suggests that under an insurance plan that specifically excluded infertility treatment, non-negligable fractions of claims paid for certain tubal and other surgeries were actually infertility related (Blackwell and Mercer, 2000; Jones and Allen, 2009).[30] Secondly, as mentioned above, some evidence suggests that IVF and tubal surgeries could be seen as somewhat substitutable, so a decrease in tubal surgery as a result of the mandates seems plausible (Gocial, 1995; Practice Committee of the ASRM, 2008). The negative statistically significant "mandate × 30 and older" effect seen in Table 4, Column 2 for any medical help to get pregnant is entirely driven by a decrease in the residual category of other treatment. The negative "mandate × some college" effect from Table 4 for medical help to get pregnant is associated with a small decrease in ovulation-inducing drugs (only significant at the 10% level), and a slightly larger decrease in male testing (significant at the 1% level).

In Tables 6 and 7, we present the subgroup analyses – difference-in-difference-type regressions stratified by education level (Panels A and B) and then by age (Panels C and D). While the coefficients of interest in Table 6 are less precisely estimated and somewhat smaller in magnitude than in Table 4, the patterns give us some additional confidence in our results, with the mandate interactions for the older or highly-educated women being positive and most of those for the younger or less-educated women being negative and smaller in magnitude than those for the older or highly-educated women. Given the various different treatments captured in the "any help to get pregnant" measure, we focus more attention on the stratified results for the specific treatments presented in Table 7.

[30] For example, the firm paid a small amount of claims for the procedure transcervical fallopian tube catheterization (CPT code 58345) which was estimated by Blackwell and Mercer to be 100% for infertility treatment despite the fact that the firm did not cover infertility treatment.

For more-educated women, the mandate-age interaction is positive and statistically significant for ovulation-inducing drugs, suggesting mandates for older women lead to a 1.6 percentage point increase in use of these drugs. This estimate is smaller than the DDD estimate reported in Table 5, but still significant at the 5% level. Estimated effects of mandates on ovulation-inducing drugs are around zero for the no-college women (Panel B). Turning to the results in Panels C and D, the effects on "mandate × some college" are positive for older women but not significant, and the same interaction is -0.007 and significant at the 10% level for the younger women. Effects of the mandate interactions by group for artificial insemination are positive for the mandate interactions for the some college (Panel A) and older women (Panel C) samples, and negative and smaller for the no college (Panel B) and younger (Panel D) women, although not statistically significant. Effects of the mandates on IVF are all very small in magnitude, and not statistically significant.

For some of the other outcomes, the results are somewhat less consistent with our findings from Table 5. For more-educated women, the main mandate variables have a statistically significant negative effect on both male and female testing and on tubal surgery, while the interaction with age is positive and insignificant.[31] This is also true for the effects of the main mandate variable on female testing for older women in panel C. Yet most of the mandate effects were insignificant in the Table 5 analysis for these outcomes. Finally, note that there is little effect of any of the mandate variables on the other treatment category, with one exception. For the less-educated women, mandates are associated with a decrease in other treatment for older women.

As described above, the mandates differ along several dimensions. First, some mandates require that infertility treatments be covered, while others only require that coverage be offered.

[31] This suggests a reduction in testing and tubal surgery among younger women.

In Panel A of Tables 8 and 9, we break out cover mandates from offer mandates. Focusing first on Column 2 of Table 8, the broad indicator of whether a woman received any medical help to get pregnant, shows similar effects of cover and offer mandates on utilization of services – the estimated coefficients are not statistically different between the two types of regressions. For the IVF versus non-IVF mandates, the mandates that include IVF have a larger effect (but not statistically significantly so) than the mandates that exclude it (the *F*-statistic for the two coefficients being the same is 1.14, with a *p*-value of 0.291 for the two-sided test and 0.146 for the one sided test that the IVF coefficient is smaller than the no-IVF coefficient).

However, the estimated effects of the different types of mandates are more striking when we examine the more detailed breakdown of treatments by type, in Table 8. The estimated coefficients of cover mandates on ovulation-inducing drugs, artificial insemination, and testing of the female are positive and statistically significant. Cover mandates have a larger effect than do offer mandates on the more expensive treatments of ovulation-inducing drugs (*F*-statistic is 1.77, *p*-value of 0.189 for two-sided test and 0.095 for the one sided test that the cover coefficient is smaller than the offer coefficient), and artificial insemination (*F*-statistic is 3.03, *p*-value of 0.088 for the two-sided test and 0.044 for the one sided test). The significant effects for the offer mandates seen in Table 7 come entirely from the residual other treatment category.[32] In Panel B, we break out mandates that include IVF from those that do not. Again, IVF mandates have a statistically significant and positive effect on ovulation-inducing drugs. While the point estimate for the IVF mandates is usually larger than that for the no IVF mandates, the coefficients are not statistically different from each other (even with one-sided tests). Again, we

[32] One possibility is that in offer states, women receive advice, but then realize they are not covered for more expensive treatments, and as a result stop at that point.

estimate no impact on IVF, but this is likely a consequence of the small numbers of women reporting IVF in our population data.

VI. Discussion and Conclusion

Previous evidence concerning the effect of various health insurance mandates suggests many such mandates have little impact on health care utilization. In this paper, we pool data from waves of the National Survey of Family Growth to see whether mandates for infertility treatment affect use of infertility treatment among women 15–44. Our results suggest that state-level mandates related to coverage of infertility treatment are associated with a substantial and statistically significant increase in utilization of services, with effects largest (in percentage terms) for use of ovulation-inducing drugs and artificial insemination. However, these effects are only present among a subgroup of older, more-educated women and are not visible when examining the entire population of women of childbearing age. Mandates were associated with a 24% increase in the likelihood that a woman 30 and older with some college reported receiving any medical help to get pregnant. Ovulation-inducing drug usage increased by this group by 32%, and artificial insemination by 41%. This is some of the only evidence available about population use of treatments by women, and includes effects for women who may never successfully have children. For example, of the women who obtained any medical help to get pregnant, fully 28% of all women and 25% of the older highly-educated women had no first birth after their first infertility visit, which provides a possible upper bound on the share of women who do not succeed in having a live birth despite their use of treatment.[33]

[33] Some of these women with no first birth are likely in the middle of treatment, and may yet have a child. This is an upper bound on the share of women who are unsuccessful despite obtaining infertility treatment. If we limit this calculation to those women who had no first birth after their first infertility treatment and have not had a visit for infertility treatment in the past year, assuming that these women might be the most likely to have given up trying to

One potential concern with the results presented above is that the mandates could be correlated with broader trends in fertility, and that our estimated mandate effects could therefore be picking up these broader trends. Our results suggest that, as expected, the mandates have a greater effect on the more expensive and less easily hidden types of treatment, and that help to prevent miscarriage is largely unaffected by the mandates. Both of these findings lend confidence to our interpretation of the results.

One implication of our findings is that subgroup analysis is likely to be important when analyzing the utilization and health impacts of various health insurance mandates. This is particularly true given that most health insurance mandates only apply to a relatively small share of private-sector employees. Since mandates are enacted to affect utilization of services and, ultimately, health outcomes, understanding why certain mandates affect these variables is important for policy efficacy. One possible explanation for our findings of a utilization effect, when few of these effects have been found in the broader mandate literature, is that in the case of infertility treatment, those individuals who are most likely to demand services (women who are older and highly-educated) are also most likely to be affected by the mandate due to their higher probability of having private health insurance. For many other mandates, these two populations may not be the same. In those cases, affecting health outcomes may require other policy interventions.

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conceive, we see that 14% of all women and 15% of the older educated women fall into this category. Of the remaining women, 43% of all women and 46% of the older, more-educated women had a first birth after their first visit; and 29% of both sets of women had already had a first birth before the first visit, and may therefore have been seeking treatment for secondary infertility. We can not tell what the outcomes are for the women with any first birth before their first visit. We have not further examined these timing variables, as they are only reported in the last 2 waves of the NSFG.

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Table 1: States with Mandated Infertility Insurance

State	Year law enacted	Mandate to cover/offer to cover	IVF covered?
Arkansas	1987[a]	Cover	Yes
California	1989	Offer	No
Connecticut	1989[b]	Offer	Yes
Hawaii	1987	Cover	Yes
Illinois	1991	Cover	Yes
Louisiana	2001	Cover	No
Maryland	1985	Cover	Yes
Massachusetts	1987	Cover	Yes
Montana	1987	Cover	Yes
New Jersey	2001	Cover	Yes
New York	1990[c]	Cover	No
Ohio	1990[d]	Cover	Yes
Rhode Island	1989	Cover	Yes
Texas	1987	Offer	Yes
West Virginia	1977[e]	Cover	No

Source: Schmidt (2007).
[a] Some coverage for IVF was first required in 1987. The law was revised in 1991 to set maximum and minimum benefit levels and to establish standards for determining whether a policy or certificate must include coverage (see Appendix A of Schmidt (2005)).
[b] In 2005, Connecticut changed their offer mandate to a cover mandate.
[c] In 2002, New York passed a revised law that clarified the 1990 legislation and appropriated $10 million to a pilot project to help pay for IVF for a small number of individuals.
[d] The original 1991 law did not specifically exclude IVF but in 1997 the state Superintendent of Insurance stated that IVF, GIFT,a nd ZIFT were not essential for the protection of an individual's health and were therefore not subject to mandated coverage. We code Ohio as an IVF state through 1997.
[e] In 2001, the law was amended to mandate that HMOs must cover infertility treatment only as a "preventative service" benefit (thus, excluding IVF).

Table 2: Share of women obtaining one treatment who had each of the other treatments, all women, pooled NSFG data

	Ovulation inducing drugs	Artificial insemination	IVF	Testing of female	Testing of male	Tubal surgery	Any other treatment	Other treatment and not 1–5
A. Share of women in row group getting treatment								
All women	0.034	0.008	0.002	0.039	0.035	0.013	0.076	0.038
Women who got help to get pregnant	0.337	0.081	0.017	0.388	0.351	0.126	0.763	0.377
B. Share of women getting column treatment who also used:								
Ovulation inducing drugs	1	0.71	0.65	0.54	0.49	0.49	0.30	0
Artificial insemination	0.17	1	0.46	0.18	0.17	0.17	0.08	0
IVF	0.03	0.10	1	0.04	0.04	0.06	0.02	0
Testing of female	0.62	0.85	0.80	1	0.75	0.62	0.36	0
Testing of male	0.52	0.75	0.79	0.68	1	0.53	0.34	0
Tubal surgery	0.18	0.27	0.42	0.20	0.19	1	0.11	0
Any other treatment	0.69	0.78	0.78	0.70	0.74	0.69	1	1
Other treatment, not rows 1–5	0	0	0	0	0	0	0.48	1

Notes: Shown are weighted averages among various samples of women who have ever had sex after menarche for various outcomes. Panel A contains the share of the women in the row sample who obtained the treatments in the column headings. Panel B contains the share of women getting the treatment in the column heading who also got the treatment in the row label. Treatments are not mutually exclusive (with the exception of the last row/column "other treatment none of the specific ones" which is mutually exclusive with the specific treatments. The "other treatments" in some years includes advice on timing sex or timing use of birth control or other advice and other surgeries (e.g., fibroids). Data are from pooled 1982, 1988, 1995, and 2002 waves of the NSFG. Rounding for various rows done independently.

Table 3: Summary statistics for use of infertility treatment and fertility outcomes, all women and by group, pooled NSFG data

	All	Age under 30		Age 30 and older	
	Women	No college	Some college	No college	Some college
Ever had any infertility treatment	0.145	0.073	0.088	0.162	0.228
(to get pregnant or prevent miscarriage)	(0.002)	(0.005)	(0.004)	(0.004)	(0.004)
Ever had treatment to help get pregnant	0.100	0.048	0.048	0.112	0.168
	(0.002)	(0.003)	(0.004)	(0.003)	(0.003)
Ever had treatment to prevent miscarriage	0.068	0.048	0.033	0.073	0.103
	(0.001)	(0.003)	(0.003)	(0.003)	(0.003)
Type of treatments to help get pregnant (not mutually exclusive)					
Ovulation-inducing drugs	0.034	0.014	0.014	0.034	0.065
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Artificial insemination	0.008	0.001	0.002	0.008	0.019
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
In vitro fertilization	0.002	0.0002	0.0002	0.0008	0.0049
	(0.0002)	(0.0005)	(0.0005)	(0.0004)	(0.0004)
Woman tested for infertility	0.039	0.013	0.013	0.040	0.077
	(0.001)	(0.002)	(0.003)	(0.002)	(0.002)
Man tested for infertility	0.035	0.014	0.011	0.036	0.069
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Surgery to correct blocked Fallopian tubes	0.013	0.005	0.003	0.016	0.023
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Some other treatment	0.038	0.023	0.023	0.044	0.055
	(0.001)	(0.002)	(0.003)	(0.002)	(0.002)
Private insurance paid for treatment†	0.070	0.020	0.030	0.073	0.126
	(0.002)	(0.004)	(0.005)	(0.004)	(0.003)
No private insurance to pay for treatment†	0.023	0.015	0.007	0.025	0.035
	(0.001)	(0.002)	(0.003)	(0.002)	(0.002)
N	30,149	11,328	6182	8973	8425

Notes: Shown are weighted averages among women who have ever had sex after menarche for various outcomes. The means are for the sample of women described in the column labels (with the exception that one of the miscarriage measures is only for women with at least one pregnancy). Only women who reported getting medical help to get pregnant are asked about the types of treatment they received. Treatments are not mutually exclusive. Other treatment in some years includes advice on timing sex or timing use of birth control or other advice. Data are from pooled 1982, 1988, 1995, and 2002 waves of the NSFG. Rounding for various rows done independently. † Questions on how they paid for the medical help to get pregnant are only asked in the 1995 and 2002 waves of the NSFG.

Table 4: Determinants of any infertility treatment, medical help to get pregnant, and medical help to avoid miscarriage

	Any infertility treatment	Medical help to get pregnant	Medical help to avoid miscarriage
Any mandate	0.007	0.004	0.002
	(0.011)	(0.010)	(0.007)
Age 30 and older	0.079***	0.072***	0.022***
	(0.007)	(0.007)	(0.005)
Some college	-0.016**	-0.0001	-0.015***
	(0.007)	(0.005)	(0.005)
Mandate $*$ 30 and older	-0.021	-0.027**	0.003
	(0.013)	(0.010)	(0.009)
Mandate $*$ some college	-0.013	-0.015**	-0.004
	(0.009)	(0.007)	(0.008)
30 and older $*$ some college	0.071***	0.046***	0.043***
	(0.012)	(0.010)	(0.008)
Mandate $*$ $>=$ 30 $*$ some college	0.041**	0.041**	0.008
	(0.018)	(0.016)	(0.013)
Mean, no mandate in effect, women $>=$ 30 & some college	0.228	0.170	0.100
3 way interaction as share of mean	0.18	0.24	0.08

Notes: Shown are coefficients from least squares regressions of the determinants of ever having had various types of infertility treatments. Each column presents results from a single regression. Regressions are weighted, with standard errors clustered at the state level in parentheses. Specifications include state and year of interview fixed effects and individual demographic and state-by-year level demographic, policy, and economic controls. Data are from pooled 1982, 1988, 1995, and 2002 waves of the NSFG. Sample is all women who ever had sex after menarche. ***, **, and * denote significance of the coefficient at the 1, 5, and 10 percent levels. Bottom two rows present pre-mandate mean of dependent variable for women ≥ 30 and the 3 way interaction effect (coefficient on mandate $*$ $>=$ 30 * some college) as a share of the baseline mean.

Table 5: Determinants of specific medical treatments to help get pregnant

	Ovulation inducing drugs	Artificial insemination	IVF	Testing of female	Testing of male	Tubal surgery	Other Treatment
Any mandate	0.001	-0.0001	0.0008	-0.005	-0.003	0.0003	0.005
	(0.004)	(0.0029)	(0.0012)	(0.006)	(0.006)	(0.0028)	(0.008)
Age 30 and older	0.020***	0.006***	0.0004	0.027***	0.022***	0.010***	0.026***
	(0.003)	(0.001)	(0.0006)	(0.004)	(0.004)	(0.002)	(0.006)
Some college	-0.002	-0.0006	-0.0005	-0.004	-0.004	-0.003	0.001
	(0.003)	(0.0012)	(0.0003)	(0.003)	(0.003)	(0.002)	(0.003)
Mandate $*$ 30 and older	-0.004	-0.0005	0.0002	-0.008	-0.002	0.0002	-0.013**
	(0.005)	(0.0027)	(0.0006)	(0.007)	(0.007)	(0.0029)	(0.006)
Mandate $*$ some college	-0.008*	-0.001	0.0011	-0.007	-0.010***	-0.001	-0.002
	(0.004)	(0.002)	(0.0010)	(0.005)	(0.004)	(0.002)	(0.005)
30 and older $*$ some college	0.026***	0.008***	0.0041***	0.033***	0.032***	0.010***	0.008
	(0.005)	(0.003)	(0.0011)	(0.006)	(0.006)	(0.003)	(0.007)
Mandate $*$ $>=$ 30 $*$ some college	0.020**	0.007	-0.00002	0.018	0.016	-0.002	0.011
	(0.009)	(0.005)	(0.00216)	(0.013)	(0.011)	(0.006)	(0.009)
Mean, no mandate in effect,, women $>=$ 30 & some college	0.062	0.017	0.005	0.075	0.068	0.024	0.057
3 way interaction as share of mean	0.32	0.41	-0.004	0.24	0.24	-0.08	0.19

Notes: Shown are coefficients from least squares regressions of the determinants of ever having had various types of infertility treatments. Results in column 6 for outcome "other treatment" are for some other treatment besides the ones in columns 1–5. Each column presents results from a single regression. Regressions are weighted, with standard errors clustered at the state level in parentheses. Specifications include state and year of interview fixed effects and individual demographic and state-by-year level demographic, policy, and economic controls. Data are from pooled 1982, 1988, 1995, and 2002 waves of the NSFG. Sample is all women who ever had sex after menarche. ***, **, and * denote significance of the coefficient at the 1, 5, and 10 percent levels. Bottom two rows present pre-mandate mean of dependent variable for women ≥ 30 and the 3 way interaction effect (coefficient on mandate $*$ $>=$ 30 * some college) as a share of the baseline mean.

Table 6: Determinants of any infertility treatment, medical help to get pregnant, and medical help to avoid miscarriage, by subgroup

	Any infertility treatment	Medical help to get pregnant	Medical help to avoid miscarriage
A. Sample is women with at least some college			
Any mandate	-0.008	-0.023	0.001
	(0.018)	(0.018)	(0.012)
Age 30 and older	0.150***	0.117***	0.066***
	(0.009)	(0.008)	(0.006)
Mandate ∗ 30 and older	0.019	0.014	0.011
	(0.013)	(0.012)	(0.012)
B. Sample is women with no college			
Any mandate	0.007	0.011	-0.001
	(0.014)	(0.012)	(0.008)
Age 30 and older	0.077***	0.071***	0.021***
	(0.007)	(0.007)	(0.005)
Mandate ∗ 30 and older	-0.019	-0.025**	0.004
	(0.013)	(0.009)	(0.009)
C. Sample is women 30 and older			
Any mandate	-0.003	-0.020*	0.012
	(0.017)	(0.011)	(0.014)
Some college	0.051***	0.042***	0.028***
	(0.011)	(0.010)	(0.008)
Mandate ∗ some college	0.025	0.023	0.002
	(0.016)	(0.014)	(0.011)
D. Sample is women under 30			
Any mandate	-0.006	0.001	-0.006
	(0.014)	(0.011)	(0.008)
Some college	-0.012*	0.004	-0.015***
	(0.007)	(0.005)	(0.005)
Mandate ∗ some college	-0.010	-0.012*	-0.001
	(0.009)	(0.007)	(0.007)

Notes: Shown are coefficients from least squares regressions of the determinants of ever having had various types of infertility treatments. Each panel represents regressions for a different subsample. Each column within panel presents results from a single regression. Regressions are weighted, with standard errors clustered at the state level in parentheses. Specifications include state and year of interview fixed effects and individual demographic and state-by-year level demographic, policy, and economic controls. Data are from pooled 1982, 1988, 1995, and 2002 waves of the NSFG. ***, **, and * denote significance of the coefficient at the 1, 5, and 10 percent levels.

Table 7: Determinants of specific medical treatments to help get pregnant, by subgroup

	Ovulation inducing drugs	Artificial insemination	IVF	Testing of female	Testing of male	Tubal surgery	Other Treatment
A. Sample is women with at least some college							
Any mandate	-0.011	-0.004	0.002	-0.022**	-0.023**	-0.009*	0.004
	(0.010)	(0.004)	(0.003)	(0.010)	(0.009)	(0.005)	(0.012)
Age 30 and older	0.046***	0.015***	0.004***	0.060***	0.054***	0.021***	0.034***
	(0.005)	(0.003)	(0.001)	(0.005)	(0.004)	(0.003)	(0.006)
Mandate ∗ 30 and older	0.016**	0.006	0.0002	0.010	0.013	-0.002	-0.002
	(0.008)	(0.006)	(0.0020)	(0.011)	(0.009)	(0.005)	(0.010)
B. Sample is women with no college							
Any mandate	0.006	0.002	0.0011	0.002	0.003	0.007**	0.005
	(0.005)	(0.003)	(0.0008)	(0.008)	(0.006)	(0.003)	(0.009)
Age 30 and older	0.020***	0.007***	0.0005	0.027***	0.022***	0.010***	0.026***
	(0.003)	(0.001)	(0.0006)	(0.004)	(0.004)	(0.002)	(0.006)
Mandate ∗ 30 and older	-0.003	-0.0003	0.0002	-0.007	-0.001	0.0001	-0.012**
	(0.005)	(0.0027)	(0.0006)	(0.007)	(0.006)	(0.0030)	(0.006)
C. Sample is women 30 and older							
Any mandate	-0.004	-0.002	0.001	-0.019**	-0.009	-0.0005	-0.003
	(0.008)	(0.004)	(0.002)	(0.009)	(0.007)	(0.0050)	(0.010)
Some college	0.021***	0.007**	0.003***	0.025***	0.025***	0.007***	0.010
	(0.004)	(0.003)	(0.001)	(0.005)	(0.005)	(0.003)	(0.007)
Mandate ∗ some college	0.013	0.006	0.001	0.010	0.004	-0.002	0.008
	(0.009)	(0.006)	(0.002)	(0.010)	(0.010)	(0.005)	(0.009)
D. Sample is women under 30							
Any mandate	0.002	0.001	-0.00005	0.002	0.0006	0.0005	0.003
	(0.005)	(0.002)	(0.00045)	(0.006)	(0.0052)	(0.0025)	(0.008)
Some college	0.001	0.0007	-0.0003	-0.00005	-0.0006	-0.002	0.001
	(0.003)	(0.0011)	(0.0004)	(0.00287)	(0.0027)	(0.002)	(0.003)
Mandate ∗ some college	-0.007*	-0.0006	0.0013	-0.004	-0.008**	-0.001	-0.001
	(0.004)	(0.0019)	(0.0011)	(0.005)	(0.004)	(0.002)	(0.005)

Notes: Shown are coefficients from least squares regressions of the determinants of ever having had various types of infertility treatments. Each panel represents regressions for a different subsample. Results in column 6 for outcome "other treatment" are for some other treatment besides the ones in columns 1–5. Each column within panel presents results from a single regression. Regressions are weighted, with standard errors clustered at the state level in parentheses. Specifications include state and year of interview fixed effects and individual demographic and state-by-year level demographic, policy, and economic controls. Data are from pooled 1982, 1988, 1995, and 2002 waves of the NSFG. ***, **, and * denote significance of the coefficient at the 1, 5, and 10 percent levels.

Table 8: Determinants of any infertility treatment, medical help to get pregnant, and medical help to avoid miscarriage, by type of mandate

	Any infertility treatment	Medical help to get pregnant	Medical help to avoid miscarriage
A. Mandate varies by whether mandate is to cover or offer			
Cover mandate $* >= 30 *$ some college	0.055**	0.040	0.027*
	(0.027)	(0.024)	(0.015)
Offer mandate $* >= 30 *$ some college	0.026*	0.043***	-0.014
	(0.014)	(0.014)	(0.009)
F-statistic, test coefficients equal	1.25	0.02	8.95
p-value, 2 sided test	(0.269)	(0.900)	(0.004)
p-value, 1 sided test, null cover less than offer	[0.135]	[0.550]	[0.002]
B. Mandate varies by whether IVF is excluded or not			
Mandate with IVF $* >= 30 *$ some college	0.049**	0.052***	0.016
	(0.021)	(0.015)	(0.020)
Mandate no IVF $* >= 30 *$ some college	0.030	0.028	-0.002
	(0.025)	(0.022)	(0.016)
F-statistic, test coefficients equal	0.46	1.14	0.62
p-value, 2 sided test	(0.499)	(0.291)	(0.435)
p-value, 1 sided test, null IVF less than no IVF	[0.250]	[0.146]	[0.218]

Notes: Shown are coefficients from least squares regressions of the determinants of ever having had various types of infertility treatments. Each panel contains results with a different set of mandate education age interactions. Each column within panel presents results from a single regression. At bottom of panel, F-tests for equality of the coefficients shown are reported, along with p-values from two-sided tests in parentheses and the $p-$values from one-sided test of the null that the cover coefficient is less than the offer coefficient (panel A) or the null that the IVF allowed coefficient is less than the no IVF coefficient (panel B), in brackets. Regressions are weighted, with standard errors clustered at the state level in parentheses. Specifications include state and year of interview fixed effects and individual demographic and state-by-year level demographic, policy, and economic controls. Data are from pooled 1982, 1988, 1995, and 2002 waves of the NSFG. Sample is all women who ever had sex after menarche. ***, **, and * denote significance of the coefficient at the 1, 5, and 10 percent levels.

Table 9: Determinants of specific medical treatments to help get pregnant, by type of mandate

	Ovulation inducing drugs	Artificial insemination	IVF	Testing of female	Testing of male	Tubal surgery	Other Treatment
A. Mandate varies by whether mandate is to cover or offer							
Cover mandate $* >= 30 *$	0.030**	0.012*	0.001	0.034*	0.025	-0.0002	-0.005
some college	(0.014)	(0.006)	(0.003)	(0.017)	(0.016)	(0.0057)	(0.009)
Offer mandate $* >= 30 *$	0.009	0.0006	-0.001	-0.0005	0.005	-0.003	0.029***
some college	(0.009)	(0.0048)	(0.001)	(0.0067)	(0.007)	(0.008)	(0.007)
F-statistic, test coefficients equal	1.77	3.03	0.47	4.35	1.77	0.13	18.96
p-value, 2 sided test	(0.189)	(0.088)	(0.495)	(0.042)	(0.189)	(0.722)	(0.0001)
p-value, 1 sided test, null cover less than offer	[0.095]	[0.044]	[0.248]	[0.021]	[0.095]	[0.361]	[0.99997]
B. Mandate varies by whether IVF is excluded or not							
Mandate with IVF$* >= 30 *$	0.028***	0.005	-0.0006	0.018	0.021	0.002	0.013
some college	(0.010)	(0.007)	(0.003)	(0.014)	(0.013)	(0.004)	(0.010)
Mandate no IVF $* >= 30 *$	0.011	0.008	0.0007	0.015	0.010	- 0.006	0.009
some college	(0.013)	(0.005)	(0.0018)	(0.018)	(0.013)	(0.008)	(0.023)
F-statistic, test coefficients equal	1.02	0.18	0.14	0.02	0.45	1.35	0.06
p-value, 2 sided test	(0.318)	(0.672)	(0.711)	(0.902)	(0.503)	(0.250)	(0.814)
p-value, 1 sided test, null IVF less than no IVF	[0.159]	[0.664]	[0.645]	[0.451]	[0.252]	[0.125]	[0.407]

Notes: Shown are coefficients from least squares regressions of the determinants of ever having had various types of infertility treatments. Each panel contains results with a different set of mandate education age interactions. Each column within panel presents results from a single regression. At bottom of panel, F-tests for equality of the coefficients shown are reported, along with p-values from two-sided tests in parentheses and the $p-$values from one-sided test of the null that the cover coefficient is less than the offer coefficient (panel A) or the null that the IVF allowed coefficient is less than the no IVF coefficient (panel B), in brackets. Regressions are weighted, with standard errors clustered at the state level in parentheses. Specifications include state and year of interview fixed effects and individual demographic and state-by-year level demographic, policy, and economic controls. Data are from pooled 1982, 1988, 1995, and 2002 waves of the NSFG. Sample is all women who ever had sex after menarche. ***, **, and * denote significance of the coefficient at the 1, 5, and 10 percent levels.