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Utilization of Infertility Services: How Much Does Money Matter?

J. Farley Ordovensky Staniec and Natalie J. Webb

Objective. To estimate the effects of financial access and other individual characteristics on the likelihood that a woman pursues infertility treatment and the choice of treatment type.

Data Source/Study Setting. The 1995 National Survey of Family Growth.

Study Design. We use a binomial logit model to estimate the effects of financial access and individual characteristics on the likelihood that a woman pursues infertility treatment. We then use a multinomial logit model to estimate the differential effects of these variables across treatment types.

Data Collection/Extraction Method. This study analyzes the subset of 1,210 women who meet the definition of infertile or subfecund from the 1995 National Survey of Family Growth.

Principal Findings. We find that income, insurance coverage, age, and parity (number of previous births) all significantly affect the probability of seeking infertility treatment; however, the effect of these variables on choice of treatment type varies significantly. Neither income nor insurance influences the probability of seeking advice, a relatively low cost, low yield treatment. At the other end of the spectrum, the choice to pursue assisted reproductive technologies (ARTs)—a much more expensive but potentially more productive option—is highly influenced by income, but merely having private insurance has no significant effect. In the middle of the spectrum are treatment options such as testing, surgery, and medications, for which "financial access" increases their probability of selection.

Conclusions. Our results illustrate that for the sample of infertile of subfecund women of childbearing age studied, and considering their options, financial access to infertility treatment does matter.

Key Words. Health economics, health care financing, insurance, premiums, access, demand, utilization of services

For many women, the major questions in contemplating pregnancy are "Do I want children?" or "When is the best time for me to have a child?" However, for the nearly seven million infertile couples in the United States, the path to parenthood is full of many more questions, primary among them "How will

we get pregnant?" in many cases followed closely by "How will we afford it?" While advances in infertility research and reproductive technology have increased the options open to infertile couples over the last several decades, most couples seeking treatment find that much or all of the cost, particularly of assisted reproductive technologies (ARTs), is not covered by insurance (Fidler and Bernstein 1999). Thus, for couples for whom low cost attempts at achieving pregnancy have failed, the ability to have a biological child may depend on having the disposable income to buy access to treatment.

In this paper, we extend earlier studies of the choice to pursue infertility treatment by examining in greater detail the relationship between income, insurance, and the choice not just of whether to seek treatment, but of what types of treatment to pursue. Advice and basic testing are relatively low-cost, noninvasive services, and are more likely to be covered by insurance, even if that insurance does not explicitly cover infertility treatment. At the other extreme, in vitro fertilization (IVF) can be very expensive, highly invasive, and is usually not covered. Lumping these and other treatment options together as the choice to "seek help getting pregnant," as has been done in other empirical studies of service-seeking behavior, may mask significant differences in the effects of socioeconomic variables on the choice to pursue treatment. Understanding the impact of "financial access" on the choice among infertility treatment options can help inform the discussion of whether such services are adequately accessible to those who need them.

We begin, in the first section, by defining infertility for purposes of this study, describing the data we use, and defining options for treatment. In the next section, we investigate the factors affecting service seeking and choice of infertility treatments. In the penultimate section, we offer results of our analyses of these factors. In the concluding section, we summarize the main results and discuss limitations and future research questions that follow from our findings.

Infertility—Incidence and Treatment Options

The generally accepted definition of infertility (particularly as it regards doctors' willingness to initiate evaluation and treatment) is the inability to con-

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Address correspondence to J. Farley Ordovensky Staniec, Ph.D., Associate Professor, Department of Economics, University of the Pacific, Stockton, CA 95211. Natalie J. Webb, Ph.D., Associate Professor of Economics, is with the Defense Resources Management Institute, Naval Postgraduate School, Monterey, CA.

ceive after a year of unprotected intercourse in women under 35, or after 6 months in women 35 or older. Most studies of infertility also include couples with "impaired fecundity" caused by physical problems such as anovulation, tubal blockage, and low sperm count (Stephen and Chandra 2000). Infertility has typically been treated as a women's problem; yet, roughly one-half of infertility cases with defined causes can be traced solely (30–40 percent) or partially to male factors (Whitman-Elia and Baxley 2001).[1]

The National Survey of Family Growth (NSFG) provides some of the most detailed information available about the incidence of infertility and pursuit of treatment by individuals in the United States. The data used in this paper come from NSFG Cycle V, conducted in 1995, which surveyed 10,847 women.[2] Of these women, 1,014 reported difficulty getting pregnant; while another 196 could be considered subfecund due to the length of time they reported unprotected intercourse without conception. Thus, 1,210 women—over 11 percent of those surveyed—could be defined as having, or being part of a couple that has some type of fertility issue.

The first two columns of Table 1 provide means of selected individual characteristic variables, including income and insurance coverage, for the entire sample (1,210) of women and for those with a fertility problem. Not surprisingly, women over 30 years old make up a larger percentage of infertile women (65.3 percent) than of the sample as a whole (53.8 percent).[3] Among the women with some fertility problem, 31 percent reported seeking medical help to get pregnant. The third and fourth columns in Table 1 present the means of the individual characteristics for those infertile women who sought assistance and those who did not, respectively. *T*-tests for differences in means across these two subgroups reveal significant differences in every category. As would be expected, increasing age, income, and education all lead to increased probability of seeking help. There are also significant differences in means by race. White women have a greater probability of pursuing infertility treatments, while the proportion of Hispanic and black women obtaining medical assistance is significantly lower than the proportion who choose not to seek treatment.

Options for Treatment

Once a couple decides to seek medical assistance to deal with infertility, treatment options range from simple consultations to invasive, expensive medical interventions. Basic consultations that provide advice on timing of intercourse and changes in lifestyle to enhance fertility may be all that many couples need to successfully conceive. However, if following this advice is not

Table 1: Percentage of Women (Age 15–44) with Selected Individual Characteristics by Fertility and Service-Seeking Status (Standard Errors in Parentheses)

		Infertile/Subfecund Women		
Characteristic	*All Women N= 10,847*	*All N= 1,210*	*Sought Help N= 370*	*No Help N= 840*
Age				
15–21	20.8 (0.4)	10.0 (0.9)	1.3 (0.7)	**13.9*** (1.3)
22–29	25.4 (0.4)	24.7 (1.3)	19.3 (2.2)	**27.1*** (1.6)
30–34	18.2 (0.4)	22.5 (1.3)	23.9 (2.4)	21.9 (1.6)
35–44	35.6 (0.5)	42.8 (1.5)	55.4 (2.7)	**37.0*** (2.0)
Race				
White (non-Hispanic)	70.6 (0.8)	69.0 (1.5)	77.0 (2.2)	**65.4*** (1.9)
Black (non-Hispanic)	13.6 (0.6)	13.1 (0.9)	10.4 (1.5)	**14.3*** (1.2)
Hispanic	11.1 (0.6)	11.6 (1.1)	7.7 (1.4)	**13.4*** (1.4)
Other non-Hispanic	4.6 (0.4)	6.3 (1.0)	4.9 (1.5)	6.9 (1.2)
Income (as % of poverty line)				
< 150	22.6 (0.5)	21.3 (1.3)	9.8 (1.8)	**26.6*** (1.6)
150–400	46.4 (0.7)	43.6 (1.6)	43.1 (2.6)	43.8 (1.9)
> 400	31.1 (0.6)	35.1 (1.6)	47.1 (2.9)	**29.6*** (1.8)
Insurance (in previous 12 months)				
Private or military	75.8 (0.6)	73.8 (1.5)	85.7 (2.2)	**68.4*** (1.9)
Public or none	24.2 (0.6)	26.2 (1.5)	14.3 (2.2)	**31.6*** (1.9)
Education				
No degree	20.8 (0.5)	15.6 (1.3)	5.8 (1.2)	**20.1*** (1.6)
HS, but no college degree	59.1 (0.6)	63.9 (1.6)	64.5 (2.6)	63.6 (1.9)
Bachelor's degree only	15.2 (0.4)	15.5 (1.3)	21.4 (2.3)	**12.8*** (1.5)
Grad/professional Degree	4.3 (0.2)	4.4 (0.6)	7.9 (1.4)	**2.9*** (0.6)
Parity				
No children	41.9 (0.7)	44.6 (1.7)	47.6 (2.8)	43.2 (1.9)
One child	17.8 (0.4)	26.3 (1.4)	29.0 (2.6)	25.0 (1.7)
> 1 child	40.3 (0.6)	29.2 (1.4)	23.3 (2.3)	**31.8*** (1.7)

Boldface indicates statistical significance.
*Difference between proportions for those who sought treatment and those who did not is significant at $p<.01$.
Note. Columns sum to 100% within variable category.

successful and the couple wishes to proceed, a battery of tests and exams is run on both partners. While there is great variability in infertility evaluations (Glastein, Harlow, and Hornstein 1997), standard diagnostics range from simple blood tests and semen analysis to more invasive tests (including endometrial biopsy and laparoscopy) of the woman's reproductive organs.

In cases where a specific cause of infertility is found, the treatment choice may be obvious. Many couples become pregnant after treating the cause of the

problem, such as a thyroid problem or a sexually transmitted infection. In some instances, surgery may be required to resolve the problem; for example, to repair endometriosis or other damage to a woman's reproductive organs or to treat some causes of male infertility. If these first treatment options are unwarranted or unsuccessful, the most common next step is to treat female patients with drugs to stimulate ovulation. The cost of these drugs can range from $50 to $3,000 per cycle, with the more expensive drugs (typically injected rather than taken orally) generally resulting in more eggs produced per cycle—increasing the probabilities of success and multiple births (Van Voohis and Syrop 2000).

For the 20 percent of infertile couples with no explained causes (Whitman-Elia and Baxley 2001) as well as those with certain male factor problems, and those for whom ovulation stimulation alone has been unsuccessful, the typical next step is intrauterine insemination (IUI). In this procedure, sperm are injected directly into the uterus, bypassing any cervical problems and enhancing conception probabilities for couples with sperm abnormalities. The cost of this procedure can start at a few hundred dollars for a simple insemination and increase to several thousand dollars with the addition of drugs to stimulate follicular development and trigger ovulation, ultrasound monitoring for timing, and multiple inseminations in one cycle. The success rate varies widely, ranging from 3 to 18 percent or more, depending on the cause of infertility, the woman's age, and the protocol used. Most studies have found an average success (live births per cycle) rate of between 8 and 13 percent (Plosker, Jacobson, and Amato 1994; Haebe et al. 2002). While more aggressive (and expensive) protocols generally result in greater success rates, research suggests that taking both costs and probability of success into account, the "cost per delivery" is fairly similar across all IUI protocols (Van Voorhis et al. 1998).

Couples whose fertility issues are not resolved with less invasive measures may turn to IVF and related treatments as a last resort. In IVF, drugs are used to stimulate egg production, then the eggs are retrieved from the ovaries, fertilized in a lab, and transferred to the woman's uterus. Success rates for IVF have increased significantly over the past two decades. Data collected by the Centers for Disease Control indicate that at U.S. clinics in 2001, 27 percent of IVF cycles resulted in live births (Assisted Reproductive Technology Success Rates 2003). Success rates decline with each year past age 34, with a live birth rate of 35.2 percent for women under 35 years of age, falling to 15.9 percent at age 40 and 3 percent at age 45. The costs of IVF range widely across clinics, with an average per cycle cost of $12,400.[4]

In this paper, we separate women who sought some medical assistance to become pregnant into five treatment categories based on the most invasive

assistance they received. Treatment options are grouped as: advice only, testing but no treatment, ovulation stimulation with medication, surgery, and ARTs. In the ART category we include IUI, IVF, and related procedures. While these procedures admittedly differ in terms of invasiveness, success rates, and costs, they are similar in that they are generally pursued only after other diagnostic problems are solved and less invasive approaches have failed. Also, we are restricted for estimation reasons from separating this treatment group any more specifically due to the small number of women in our sample who report choosing ART.

Although it cannot be accurately defined as an ordinal variable, the treatment type variable assigns each woman based on the most aggressive type of infertility treatment pursued; that is, women who tried ovulation stimulation and surgery but eventually used ARTs would be included in the last category. Of the 1,091 women aged 22 and older in our sample who had difficulty conceiving, 5.9 percent sought advice only, 6.6 percent underwent testing but pursued no other treatment, 11.3 percent opted to use ovulation-inducing medications but no further intervention, 3.4 percent chose surgical treatment for potential fertility impairments (e.g., endometriosis or fibroids), and 5.9 percent pursued ART. The remaining two-thirds of the sample (67 percent) sought no infertility services of any kind.

Service-Seeking Behavior and the Choice of Treatment Options

Our primary focus in this study is to investigate the impact of income and insurance coverage on a couple's likelihood of pursuing medical intervention for infertility and on their choice of treatment option. Beyond the expected positive effects of these "financial access" factors, however, lie less obvious access and utilization issues. Less-educated couples may be less informed about available infertility treatments, even holding income constant. Couples of different races, ethnic origins, or religions may be more or less willing to pursue medical assistance for infertility problems. Couples who already have at least one child may feel less compelled to undergo invasive procedures to conceive a child. Thus, even with similar insurance and incomes, different couples may make very different treatment choices. As different treatments have different likelihoods of success, differences in treatment choice by demographic characteristic may result in significant differences in which infertile couples ultimately are able to bear children.

Several previous studies, all using different cycles of NSFG data, have estimated the effects of individual characteristics on the likelihood of seeking medical help for infertility. Kalmuss (1987, using NSFG cycle III) and Stephen and Chandra (2000, NSFG cycle V) both examine the choice between seeking help to get (and remain) pregnant or seeking no assistance, where help can be defined anywhere from simply getting advice to undergoing in-vitro fertilization. Wilcox and Mosher (1993, NSFG cycle IV) also estimated a dichotomous choice, but defined the choice between using "specialized fertility services" (ovulation drugs, surgery, ART) and using no treatments beyond advice and testing (including using no treatments of any sort).

For comparison with these previous studies, we first estimate a simple logit model with a dichotomous dependent variable indicating whether the respondent ever sought medical help to get pregnant.[5] We use the same data set as Stephen and Chandra (2000, NSFG Cycle V) similarly restricted to infertile/subfecund women over the age of 21; however, unlike that study, we do not count as service-seekers those infertile women whose only treatment was "medical help to prevent miscarriage." The explanatory variables are largely the same, with a few slight differences in specification. We include age, education, parity, race, marital status, education, income, and insurance coverage.[6]

One notable specification difference between our model and those in previous studies is in measuring parity. Rather than classifying women in two categories as either having no children or at least one (as in Stephen and Chandra [2000] and Wilcox and Mosher [1993]) or defining parity as a continuous variable measuring number of live births (as in Kalmuss [1987]), we define parity using three categories—no previous live births, one live birth, or more than one. The multiple births group is the omitted reference category in the estimation of the model. We expect women with no children to be most likely to seek treatment but want to allow for the possibility that women with one may be more likely than those with several children to pursue medical help should they develop fertility problems.

Using the same explanatory variables as in our binomial logit, we next estimate the effects of these characteristics on choice of treatment type using the multinomial logit model.[7] In this model, the choice of not seeking any treatment is the reference category. Thus, for every other treatment category (advice, testing, drugs, surgery, ART) estimation of the model yields coefficients expressing the effect of the independent variables on the log of the probability of choosing that treatment type relative to the probability of choosing no treatment at all.

Based on previous studies (and simple economics), we would expect the ability-to-pay or "financial access" variables of income and insurance to be positively related to the choice of service seeking. However, we hypothesize that the importance of these factors to the likelihood of seeking service varies significantly across the type of treatment considered. For instance, income might be expected to have more of an impact on the choice to pursue relatively high-cost options (ART) than on less costly treatments such as seeking advice.

The effects of insurance coverage on service seeking and choice of treatment type will clearly depend to a large extent on which, if any, infertility treatments are covered by insurance. Unfortunately, that information is not available in the NSFG data. The survey includes a question about whether the respondent's insurance covers infertility diagnosis and treatment, but it makes no distinction among treatment types and, much more problematic, it is asked only of women who reported seeking such treatment. The only insurance information available is whether or not the respondent was covered by some insurance. Admittedly, this variable provides no information about explicit infertility coverage; nonetheless, Stephen and Chandra found it had a significant positive effect on the probability of service seeking.

The significance of private insurance coverage on the likelihood of seeking infertility treatments, despite no information on fertility coverage per se, has several potential explanations. First, while respondents with insurance may or may not have coverage for infertility treatments, respondents with no insurance definitely do not. Having any insurance clearly increases the likelihood that at least some infertility services are covered. Indeed, the data suggest a strong relationship between seeking infertility treatment and having insurance coverage for such treatment. In our data, 76 percent of the infertile couples seeking help reportedly had insurance that covered "help getting pregnant." Further, of help-seekers who had private insurance, 82.5 percent had policies that covered "help getting pregnant." Such "help" is unlikely to extend equally to all treatment options. A study from this same time period found that about 30 percent of private insurance plans did not cover "most" infertility diagnosis or treatment and over 80 percent did not cover IVF (Millsap 1996).

Additionally, couples who have insurance, even if it does not cover infertility services, may be able to get advice, basic testing, and some treatments (such as surgery for endometriosis) covered by having a doctor agree not to code the treatments as infertility related. If this is the case, one would expect insurance coverage to have a greater effect on the probability of

choosing these options than on the probability of pursuing ART, which would be impossible to disguise as not infertility related. A final explanation for the potential significance of the private insurance variable is that even if insurance does not cover infertility treatments and services utilized cannot be coded so that they might be covered, there remains the fact that having insurance serves as a gateway into the realm of medical possibilities. A woman with coverage may be more likely to visit doctors on a regular basis, during which visits infertility issues may be raised and paths of inquiry suggested that might not occur to an uninsured woman having similar difficulties in conception.

RESULTS

Determinants of Service Seeking

Table 2 shows results of the logit estimation with the dependent variable being whether or not the respondent sought (or was part of a couple who sought) medical help to become pregnant. (Data in this and the following tables are restricted to those women over 21 years old, reducing the sample size to 1,091.) Not surprisingly, the explanatory variable with the largest and most highly significant effect is being over age 35, the age at which, on average, fertility starts to significantly decline. Women in this age group are nearly twice as likely to seek infertility treatments as are women aged 22–29. The effects are similar, but somewhat smaller for women in the 30–34 age group, who have a probability of service seeking 1.5 times that of the younger women.

The variables measuring parity are also strongly positively related to seeking help. We find that having no children (relative to having more than one) dramatically increases the probability of pursuing treatment, and that even women with one child are 58 percent more likely to seek help than women with two or more. This result appears to contradict Stephen and Chandra (2000), who found that parity has no significant effects on service seeking. However, further investigation reveals that Stephen and Chandra's finding of insignificance arises from the fact that while having no children has a strong positive effect on seeking help to become pregnant, it has a nearly as strong a negative effect on the probability of seeking help to prevent miscarriage. Thus, defining "service-seekers" as those who sought help to get *or remain* pregnant, as in Stephen and Chandra, results in a net finding of insignificance. By restricting the independent variable to only seeking help to get pregnant we uncover a highly significant parity effect.

Table 2: Effects of Selected Individual Characteristics on the Probability of Seeking Medical Help to Get Pregnant

Variable	*Logit Coefficient*	*Odds Ratio*	*Marginal Effect*[§]
Age			
30–34	**0.422**[‡]	**1.525**[‡]	**0.0896**[‡]
	(0.226)	(0.345)	(0.0487)
35–44	**0.670***	**1.955***	**0.1398***
	(0.0199)	(0.389)	(0.0397)
Race			
Black	−0.199	0.819	−0.0387
	(0.221)	(0.181)	(0.0413)
Hispanic	−0.175	0.840	−0.0341
	(0.226)	(0.190)	(0.0427)
<150% poverty line	**−0.436**[‡]	**0.647**[‡]	**−0.0829**[‡]
	(0.237)	(0.153)	(0.0425)
>400% poverty line	0.035	1.036	0.0071
	(0.168)	(0.174)	(0.0340)
Private insurance last 12 months	**0.503**[†]	**1.654**[†]	**0.0951**[†]
	(0.211)	(0.348)	(0.0376)
Education			
Less than high school degree	**−0.542**[‡]	**0.582**[‡]	**−0.1010**[†]
	(0.282)	(0.164)	(0.0459)
Bachelor's degree	0.170	1.186	0.0352
	(0.208)	(0.247)	(0.0439)
Graduate/professional degree	**0.566**[‡]	**1.762**[‡]	0.1254
	(0.324)	(0.571)	(0.0772)
Parity			
No children	**0.573***	**1.774***	**0.1173***
	(0.199)	(0.354)	(0.0408)
One child	**0.459**[†]	**1.582**[†]	**0.0978**[†]
	(0.193)	(0.305)	(0.0420)
Constant	−1.771		
	(0.307)		
$F(12, 175) = 4.72$			

Sample: Infertile/subfecund women age 22–44, $N = 1{,}091$ (standard errors in parentheses). Boldface indicates statistical significance.

*Significant at $p < .01$;

[†]Significant at $p < .05$;

[‡]Significant at $p < .10$.

[§]Change in service-seeking probability with a discrete change (from 0 to 1) in each of the explanatory variables, with all other variables set to their mean values.

Turning to the explanatory variables of greatest interest, those intended to capture "financial access" or potential economic barriers to treatment, we find income is significant in terms of decreasing the likelihood that poorer

women will seek treatment, but it does not significantly increase the likelihood that relatively well-off women (with household incomes greater than 400 percent of poverty threshold) will do so. These results indicate that even couples of moderate means are as likely as their wealthier counterparts to get some type of medical assistance for problems achieving pregnancy. Low-income women, however, are only 65 percent as likely to seek such help.

Controlling for income, being covered by private health insurance in the previous year is associated with a 65 percent increase in the probability of service seeking; this despite the fact that many insurance plans do not cover infertility treatment. The estimated marginal effect indicates that for a woman with mean values of all the other characteristics, having insurance increases the probability of service seeking by 9.5 percentage points above what it would be if that same woman had no insurance. This effect is larger than all others except that of being over 35 (which results in a 14 percentage point increase in probability of seeking treatment) and having no children (raising service-seeking likelihood by 11.7 percentage points.)

In contrast to studies using earlier data (Kalmuss 1987; Wilcox and Mosher 1993), but consistent with Stephen and Chandra (2000), we find no significant race effects on the probability of service seeking. The estimations using earlier data both found that, controlling for other factors, blacks were significantly less likely to seek treatment. Given that our estimation (and Stephen and Chandra's) also included an insurance variable, we initially hypothesized that the negative race effects of earlier studies were actually capturing a lower likelihood of blacks to have insurance. However, omitting the insurance variable in our estimation does nothing to alter the size or insignificance of the race effects. Thus, it appears that there were once racial differences in infertility service-seeking behavior, but those differences have become insignificant over time.

Determinants of Choice of Treatment

Tables 3 and 4 show the results of the multinomial logit estimation of choice among the different categories of infertility treatment. The relative risk ratios (Table 3) indicate the effect of each characteristic on the probability of choosing that alternative *relative* to the probability of choosing no treatment. For example, women aged 35–44 are 3.4 times more likely than a woman under age 30 to choose the "tests only" option rather than choose not to pursue medical attention. The marginal effects (Table 4) indicate how the presence of that characteristic (with all other variables at their mean values) changes the

Table 3: Relative Risk Ratios from Multinomial Logit Estimation of Choice of Service Type[§]

	Category of Service				
Characteristic	*Advice*	*Tests*	*Meds*	*Surgery*	*ART*
Age					
30–34	1.238	1.917	1.449	2.210	2.090
	(0.494)	(0.898)	(0.511)	(1.44)	(1.20)
35–44	1.011	**3.405***	1.541	2.703	**4.727***
	(0.373)	**(1.328)**	(0.443)	(1.70)	**(2.16)**
Black	0.776	1.059	0.819	1.259	**0.304**[‡]
	(0.304)	(0.368)	(0.253)	(0.621)	**(0.198)**
Hispanic	0.892	1.434	0.678	0.303	1.184
	(0.295)	(0.594)	(0.232)	(0.297)	(0.582)
Including <150% poverty line	1.096	0.719	0.449	0.721	**0.113**[†]
	(0.408)	(0.317)	(0.267)	(0.588)	**(0.118)**
Including >400% poverty line	0.898	**0.508**[†]	0.900	**2.500**[†]	**1.938**[‡]
	(0.314)	**(0.160)**	(0.213)	**(1.08)**	**(0.701)**
Insurance	0.752	1.788	**3.387***	**2.971**[‡]	1.291
	(0.299)	(0.734)	**(1.40)**	**(1.80)**	0.677
<High school degree	0.677	0.495	0.611	0.324	0.391
	(0.314)	(0.246)	(0.296)	(0.337)	(0.451)
BA degree or higher	1.588	1.436	1.210	**0.374**[‡]	**2.218***
	(0.582)	(0.496)	(0.301)	**(0.191)**	**(0.650)**
No children	1.292	**4.992***	1.159	1.027	**3.841***
	(0.480)	**(1.979)**	(0.373)	(0.515)	**(1.76)**
One child	**1.973**[‡]	**2.202**[‡]	1.203	1.644	1.878
	(0.720)	**(1.023)**	(0.346)	(0.827)	(0.979)
N (% of sample)	64 (5.8)	71 (6.5)	122 (11.2)	37 (3.4)	64 (5.8)

Sample: infertile/subfecund women age 22–44, $N = 1{,}091$ (standard errors in parentheses). Boldface indicates statistical significance.

*Significant at $p < .01$;

[†]Significant at $p < .05$;

[‡]Significant at $p < .10$.

[§]Effect of each characteristic on the probability of choosing each service type, relative to the probability of choosing no service.

choice probabilities across all possible treatment options. Thus, being aged 35–44 decreases the probability of choosing no service by 12.3 percentage points while significantly increasing the probabilities of at least undergoing testing (5.6 percentage points) and pursuing ART (3.2 percentage points).

Of the five categories of infertility services, seeking advice but no further testing or treatment is the only choice in which neither income nor insurance coverage have any significant effect. For options beyond "advice only" income plays a significant role in all but the choice to use ovulation-inducing

Table 4: Marginal Effects of Individual Characteristics on Probability of Choice of Service Type[§]

	Type of Service					
Characteristics	*None*	*Advice*	*Tests*	*Meds*	*Surgery*	*ART*
Age						
30–34	**−0.0887**[‡]	0.0057	0.0277	0.0259	0.0159	0.0134
	(0.0461)	(0.0234)	(0.0248)	(0.0336)	(0.0170)	(0.0142)
35–44	**−0.1226***	−0.0090	**0.0559***	0.0261	0.0178	**0.0319**[†]
	(0.0372)	(0.0199)	**(0.0181)**	(0.0249)	(0.0130)	**(0.0135)**
Black	0.0305	−0.0119	0.0044	−0.0145	0.0056	**−0.0141**[‡]
	(0.0386)	(0.0191)	(0.0152)	(0.0228)	(0.0107)	**(0.0074)**
Hispanic	0.0251	−0.0047	0.0202	−0.0298	**−0.0147**[†]	0.0039
	(0.0394)	(0.0177)	(0.0229)	(0.0240)	**(0.0067)**	(0.0096)
Including < 150% poverty	**0.0810**[‡]	0.0123	−0.0093	−0.0557	−0.0039	**−0.0245***
	(0.0422)	(0.0235)	(0.0163)	(0.0372)	(0.0140)	**(0.0082)**
Including > 400% poverty	0.0062	−0.0058	**−0.0262**[†]	−0.0091	**0.0213**[‡]	0.0136
	(0.0313)	(0.0190)	(0.0117)	(0.0196)	**(0.0122)**	(0.0098)
Insurance	**−0.0908**[†]	−0.0265	0.0180	**0.0824***	**0.0146**[†]	0.0023
	(0.0368)	(0.0272)	(0.0135)	**(0.0246)**	**(0.0072)**	(0.0085)
Less than high school degree	**0.0949**[†]	−0.0149	−0.0218	−0.0320	−0.0146	−0.0117
	(0.0421)	(0.0215)	(0.0144)	(0.0324)	(0.0096)	(0.0126)
BA degree or higher	−0.0534	0.0265	0.0139	0.0117	**−0.0150**[†]	**0.0163**[‡]
	(0.0415)	(0.0247)	(0.0171)	(0.0219)	**(0.0074)**	**(0.0096)**
No children	**−0.1067***	0.0067	**0.0775***	0.0004	−0.0021	**0.0244**[†]
	(0.0406)	(0.0208)	**(0.0246)**	(0.0269)	(0.0091)	**(0.0109)**
One child	**−0.0981**[†]	0.0392	0.0360	0.0049	0.0077	0.0103
	(0.0419)	(0.0267)	(0.0297)	(0.0248)	(0.0106)	(0.0118)

Sample: infertile/subfecund women age 22–44, $N = 1{,}091$ (standard errors in parentheses). Boldface indicates statistical significance.

*Significant at $p < .01$;

[†]Significant at $p < .05$;

[‡]Significant at $p < .10$.

[§]Change in choice probability with a discrete change (from 0 to 1) in each of the explanatory variables, with all other variables set to their mean values. (Note: Each row sums to 0, as total probability still must sum to 100%.)

medications. Having a high income increases the probability a woman will choose surgery or ART options relative to the likelihood of choosing no treatment, but makes her only 51 percent as likely to choose "tests only" relative to no treatment. The marginal effects show that for high-income women, the likelihood of pursuing surgical treatment increases 2.1 percentage points, while the probability these women choose "tests only" decreases by 2.6 percentage points.[8]

The only category in which both high and low income have significant effects on treatment choice is the ART option. These are the treatments least likely to be covered by insurance and that can be expensive. Women with incomes less than 150 percent of the poverty line are only 11 percent as likely as even moderate income women to select ART rather than no treatments at all. In contrast, higher income women are nearly twice as likely to pursue these options. While the decrease in the relative likelihood of ART for poorer women is dramatic, the most notable difference in the distribution of choice probabilities for low income women is the 8.1 percentage point increase in the probability of simply not seeking any type of treatment, all else held constant.

Controlling for income, having insurance significantly decreases the likelihood that infertile women will forgo treatment. The probability of choosing no treatment of any kind decreases by 9.1 percentage points for women who have private insurance (as noted earlier, we do not know whether the insurance covers infertility treatments). The treatment option that sees the greatest increase in choice probability for women with insurance is the use of ovulation-inducing medications. Women who had health insurance were 3.4 times more likely than uninsured women to choose this option relative to opting for no treatment. While many insurance plans do not cover more aggressive or invasive (and expensive) infertility treatments, they may cover the cost of some basic medications. It is possible that doctors may suggest this treatment, even if it is not the most effective option, because it may be covered by insurance.

The only other category for which having insurance is a significant predictor of treatment choice is, not surprisingly, the surgery (or other treatments for endometriosis) option. Having private insurance results in a nearly threefold increase in the likelihood of choosing to pursue surgical treatment relative to the probability of doing nothing. Since surgery can be expensive, particularly given the risk of complications, women without insurance coverage would naturally be less inclined to select that option. Also, doctors may be able to get some surgeries authorized without having to code them as infertility treatments, so that even insurance plans which do not cover infertility may pay for surgery for endometriosis or fibroids. Despite the fact that insurance may not cover "infertility treatments" the marginal effects clearly show that having private insurance significantly changes the distribution of treatment choice probabilities, making a woman more likely to treat infertility with medication or surgery and much less likely to take no action.

Of final note in the multinomial logit results are the coefficients on the race variables. Recall that in the binomial logit estimation of the probability of

service seeking, neither blacks nor Hispanics had behavior significantly different from other races (predominantly whites). This lack of significance persists in the estimation of race effects on choice among treatment alternatives with two exceptions. The marginal effect of being black is to reduce the probability of choosing ART by 1.4 percentage points, while the marginal effect of being Hispanic has roughly the same negative impact on the choice of the surgery option. As the estimation controls for income, insurance, and certain other demographic characteristics, it is unclear to what we can attribute this effect. These findings support those of Zuvekas and Taliaferro (2003), which suggest that even well-insured minorities have different health care access and use patterns than similar white patients. This result is worth further investigation as it could indicate some noneconomic racial disparities in utilization of more advanced reproductive technologies.

CONCLUSION

The results of our estimations support the findings of previous research that "financial access" variables of income and insurance have significant effects on the probability of seeking infertility treatments. We expand on earlier studies by examining the impact of these variables not only on the dichotomous choice of whether or not to pursue treatment but also on the choice among types of infertility services. In contrast to previous studies using the same data, we restrict our dependent variable in the binomial choice model to only those couples who sought help to get pregnant (excluding those who only sought help to prevent miscarriage). This seemingly minor change in definition unmasked a strongly significant, but otherwise hidden positive effect of having no children on the likelihood of service seeking. Consistent with other studies we found that once significant race effects on the dichotomous choice of service seeking have apparently diminished in importance with the recent cycle of data. Controlling for income and insurance coverage, minorities are no less likely to seek infertility services than are whites, implying that financial access is the most serious barrier to seeking and receiving treatment.

In extending our analysis to choice among treatment options, we find that not all types of service are equally affected. Neither income nor insurance influences the likelihood of seeking advice, a relatively low cost but similarly low yield activity. At the other end of the spectrum, the choice to pursue ART—a much more expensive but potentially more productive option—is highly influenced by income, but again merely having private insurance has no

significant effect. Between these extremes lie treatment options such as testing, surgery, and medications, for which higher income and/or having private insurance (but not necessarily coverage for infertility treatments) increases their probability of selection. For the 11.2 percent of women of child-bearing age facing fertility problems and considering their options, money does matter.

Limitations and Future Research Questions

The results presented above offer evidence that financial access variables may significantly affect the probability of service seeking for infertile couples; however, it should be noted that the method of estimation may well lead to bias in some of the estimated coefficients. The bias arises because many of the infertile couples in the survey may not yet have reached the "highest" level of treatment they are willing to pursue.[9] Their choice, as we define it, is simply as far as they have reached at this point, not necessarily their choice of how far they are willing to go. This bias would be most evident in the age variables, as younger women with the same choice preferences as their older counterparts in many cases will not have pursued as aggressive treatments—not because they would not choose to, but simply because they have not reached that point yet. Thus, the estimation does not capture the true underlying behavioral model based on actual preferences for treatment, but it does provide evidence that these characteristics are related to significant differences in choice probabilities across treatment alternatives.

The most serious limitation of our study is the absence of detailed information regarding whether a respondent's insurance covers infertility treatments and, if so, what types of services are covered. Such data would allow us to explore the question of whether having insurance coverage for infertility treatments significantly increases utilization of those treatments. The follow-up question would be whether the benefits of increased coverage exceed the costs. Certainly some couples for whom the expected benefits of treatment are quite low may still pursue that option because of low out-of-pocket costs, leading to overconsumption of services. On the other hand, several studies have suggested that insurance coverage of ART results in fewer multiple births (thus much less medical expense due to prematurity and associated developmental issues) because couples are willing to be more cautious in any one attempt at conception. (See, for example, Jain, Harlow, and Hornstein 2002.) Clearly these questions are beyond the scope of this study, but are issues that must be researched further as we examine the effects of financial access on the utilization of infertility services.[10]

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NOTES

1. While a significant percent of infertility is attributable to male factors, we generally refer to women who report seeking treatment simply because it is the women who responded to the survey and we cannot be certain in some cases whether they have a partner.
2. As described in Potter et al. (1998) the construction of sampling weights is designed to produce estimates representative of the population of U.S. women of childbearing age (age 15–44).
3. This overrepresentation of women over 30 is likely attributable not only to age-related fertility problems but also to the fact that some women with long-standing fertility problems simply may not discover them until they begin trying to conceive in their 30s.
4. This includes the cost of medications. Source: American Society of Reproductive Medicine, http://www.asrm.org/Patients/faqs.html
5. Thus, the probability that individual i elects to seek medical help for infertility issues is $P_i = \frac{e^{\beta' X_i}}{1+e^{\beta' X_i}}$
6. Earlier versions of the model included variables for residence in an MSA (as a proxy for geographical access to specialized fertility treatments), region of residence, and religion. However, all of these variables were so insignificant that their inclusion decreased the predictive power of the model, without affecting the significance of other results, so they have been omitted. Results from these estimations are available from the authors.
7. In this model, the probability of individual i choosing service option j can be expressed as $P_{ij} = \frac{e^{\beta'_j X_i}}{\sum_{k=1}^{m} \beta'_k X_i}$ where X_i is a vector of the characteristics of the ith individual and β_j is a vector of estimated coefficients representing the effect of each of the coefficients on the log odds ratio for treatment type j. For identification, one of the treatment categories must be chosen as the "reference" option, and its vector of coefficients normalized to 0. The estimation of the multinomial logit model will then yield β_j for each of the remaining j treatment options, such that $\log \frac{P_{ij}}{P_{ir}} = X_i(\beta'_j - \beta'_r)$ where the elements of the vector β_r are normalized to 0.
8. Note that it is possible for a variable to have a significant relative risk ratio but an insignificant marginal effect on a treatment alternative (or vice versa). For example, controlling for other factors, high income women are significantly more likely to choose ART *than to choose no treatment.* However, with all other variables at their

mean values, increasing income does not significantly raise the absolute probability of choosing ART.

9. The multinomial logit model assumes independence of irrelevant alternatives (IIA); meaning that the probability of choosing one alternative relative to another does not change with the inclusion or removal of an additional alterative. To the extent that treatment choices are sequential, this assumption is likely not valid. However, alternative specifications, such as ordered logit, are less appropriate because despite our categorization, the alternatives are not pursued in a set order (or even necessarily pursued at all) by all infertile couples.
10. The ethical issues raised by these questions are often difficult to extract from the economic issues and, while beyond the scope of this paper, are discussed in detail by others (Hughes and Giacomini 2001; Ryan 2001).

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