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Assisted reproduction may change birth intentions

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Objective: To determine whether the development and expansion of assisted reproductive technology (ART) between 1982 and 1995 raised the birth intentions of subfecund people relative to fecund people.

Design: Comparison of birth intention rates among fecund and subfecund women in the 1982, 1988, and 1995 rounds of the National Survey of Family Growth, standardized by age, parity, and education.

Setting: No clinical setting.

Participant(s): Nationally representative samples of married women who were 20 to 44 years old.

Intervention(s): None.

Result(s): Between 1982 and 1995, birth intentions rose at least 2.5 times faster among subfecund women than among fecund women. This rise was not due to increasing average age at maternity over the period.

Conclusion(s): The development of ART and expansion of services may well have increased birth intentions among subfecund women between 1982 and 1995. (Fertil Steril® 2004;81:572–81. ©2004 by American Society for Reproductive Medicine.)

Key Words: Infertility, birth intentions, assisted reproduction, treatment, United States, survey research

Has the development of assisted reproduction technology (ART) increased the proportion of subfecund couples who intend to bear a child? Throughout the 1980s and 1990s, ART services became increasingly available, visible, and acceptable. This analysis will explore whether, as a result of these developments, subfecund couples during this period became more likely to express an intention for a(nother) birth. The impact of ART on birth intentions of subfecund couples is important for planners to estimate demand for infertility services. If increasingly efficient, acceptable, and accessible infertility treatments are developed, then future demand for them cannot be estimated from current rates of birth intentions among subfecund women. More services may be required than are currently expected (1).

The question of birth intentions among subfecund women will be addressed using three successive rounds of the National Survey of Family Growth (NSFG), from the years 1982, 1988, and 1995. These nationally representative cross-sectional studies are carried out by the National Center for Health Statistics, and they gather detailed information on fertility, fecundity, and reproductive intentions. The 1982 NSFG was carried out just 1 year after the introduction of in vitro fertilization (IVF) in the United States, and so it serves as a baseline. Prior rounds of the NSFG had different questionnaires and sampling strategies from the more recent rounds and, therefore, are not useful as baselines.

Miller (2) provides a broad framework for the sequence of decision making that can be applied to any reproductive outcome. It is adapted here:

Desires
$\xrightarrow{A}$ Intentions
$\xrightarrow{B}$ Instrumental behaviors
$\xrightarrow{C}$ Fertility outcome

Desires represent conscious wishes for some result. Desires are emotional and can be counterfactual: an infertile woman can desire to bear a child. These desires can be converted to intentions to achieve an outcome (arrow A), which Miller defines as "decisions made but not yet executed." Intentions are more concrete and lead directly to action toward the intended outcome (arrow B). Such action, or instrumental behavior, can take the form of contraceptive

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use, contraceptive disuse, abortion, adoption,infertility treatment, and so on, depending on the intended outcome. Finally, the instrumental behaviors lead to fertility outcomes (arrow C) such as births, averted births, and averted conceptions.

This analysis focuses only on converting desires for a live birth to intentions (arrow A). It assumes that all couples that intend a birth also desire a birth, and it does not address how changes in intentions affect subsequent states and transitions. Because the focus is on intentions instead of actions and outcomes, this study is concerned with perceptions of fecundity rather than actual fecundity. If a couple is subfecund and does not know it, they would not necessarily change their birth intentions with the appearance of ART; but for the purposes of changing reproductive intentions, this may not matter. The overwhelming media attention to ART implied ultimate control over subfecundity, which may have freed up reproductive intentions among subfecund people.

If this is true, then the proportion of subfecund couples that intend a birth should rise across the three survey rounds. To control for any overall changes in fertility norms during the period, birth intentions among fecund and subfecund couples will be compared. If ART did affect subfecund couples, then their birth intentions should rise faster than those of fecund couples.

MATERIALS AND METHODS

Data

The 1982, 1988, and 1995 rounds of the NSFG interviewed a representative sample of noninstitutionalized civilian women about their fertility, fecundity, and reproductive intentions. These samples were all drawn using similar five-stage area probability samples (3).

Women's reports of their fecundity status in the NSFG are classified by the National Center for Health Statistics as follows (4):

Contraceptively surgically sterile: The woman reports that she or her husband had an operation that rendered her or him infecund, partly or fully for contraceptive reasons.

Noncontraceptively surgically sterile: The woman reports that she had an operation that rendered her infecund due only to "medical problems with the female organs."

Nonsurgically sterile: The woman reports that neither her nor her husband is surgically sterile and it is impossible for her to conceive or deliver, or for her husband/partner to father a baby.

Subfecund: The woman reports that it is "physically difficult" for her to conceive or deliver, or for her husband/partner to father a baby, or a doctor told her never to become pregnant (again) due to risk to her health.

Long interval: The woman reports that no pregnancy occurred over 36 months of constant exposure to risk.

All couples who do not fall into these five categories are considered fecund.

The variable of interest is whether the woman, as part of a couple, intends a birth in the future. In 1982 and 1988, this question was asked as, "Looking to the future, do you and your husband intend to have a(nother) baby at some time?" In 1995, the phrase "Looking to the future" was deleted, but the language was otherwise the same. The question specifically excludes adoptions and stepchildren. The variable of interest is whether the woman, as part of a couple, intends a birth in the future. Women and men often report differently on couple-level reproductive intentions (5). However, because these questions were asked of women in all survey rounds, any reporting bias is taken to apply equally in all rounds. The women's reports of the couple intentions will be taken at face value.

Methods

All proportions are estimated using survey weights that correct for sampling probabilities, nonresponse, and stratification. The variances of these proportions are affected by the complex survey design. Following Chandra and Stephen (4), this analysis calculates variances for proportions as:

$$\sigma^2 = [pq / n]E$$

where p is the estimated proportion of interest, q is 1-p, n is the sample size, and E is the design effect. The design effect is the average factor by which variances are inflated due to the complex sample design as compared to a simple random sample of the same size. The design effects are 3.00 for 1982, 1.57 for 1988, and 1.46 for 1995 (6).

The proportions of subfecund and fecund couples that intend a birth may differ because the groups have different characteristics. For example, subfecund women are older on average than fecund women, and older women usually want fewer births than younger women. To correct for this, the proportions that intend a birth will be standardized for age, parity, and education. Further tests showed that other explanatory variables, such as race, ethnicity, metropolitan area residence, and income had no significant effect on birth intentions net of age, parity, and education.

For the age standardization, the age-specific rate of birth intentions among subfecund women are applied to the age distribution of fecund women. This shows the proportion of subfecund women who would intend a birth if subfecund women were the same age as fecund women overall. The parity standardization shows the proportion of subfecund women who would intend a birth if the distribution of the number of children they had at the time of the NSFG interview were the same as the distribution for fecund women—likewise with the distribution of educational attainment.

The control variables are defined as:

Age: five 5-year categories, from 20–24 to 40–44

Parity: zero, one, two, or more

Education: less than high school, high school, and more than high school

When the results are standardized by all three variables at once, the data includes 270 cells (five age groups by three parity groups by three education groups by two fecundity categories by three survey rounds). Twelve cells out of these 270 (4.4%) have no cases and so rates of intending a birth cannot be determined. For these missing cells, rates of intending a future birth are estimated by linear regression predicting the rate from age, parity, education, fecundity status, and survey round. Estimating this missing data does not change the substantive conclusions of the analysis, but these estimates are likely to better reflect the true rates than using a rate of zero.

Not all women are aware of their biological fecundity. As mentioned previously, this study operates on the level of perceptions, comparing birth intentions among women who report themselves as fecund with those who report themselves as subfecund. Their actual physical fecundity is less important. Yet, women who are *unsure* of their fecundity status can present a problem. It is difficult to know how the development of ART would affect a woman who is classified as fecund but has some personal doubts about her fecundity nonetheless. The cleanest comparison between fecund and subfecund women would only include those who are certain of their fecundity status.

It can be assumed that surgically sterile women are certain of their status. Similarly, the subfecund category only includes women who assert that they have some problem getting pregnant, so they are at least aware of their status. Yet, the fecund group—the residual category—would include most women who are unsure of their status. For example, single women who contracept or are not in heterosexual unions may not know if they are fecund. Divorced, widowed, and separated women may not be aware of their current fecundity status if their marriage ended long ago or if their former partner was subfecund. In order to exclude women who may not be sure of their status, this analysis is restricted to currently married women. Moreover, the number of teenagers who are married and report themselves as anything other than fecund is tiny in all survey years. These young women have probably not been married long enough to be entirely sure of their fecundity status. For this reason, this analysis will only include women who are 20 to 44 years old.

The "long interval" group, which constitutes less than 2% of married respondents in all three survey rounds, also raises questions about awareness of fecundity status. These women have not had a pregnancy after three years of continuous exposure to risk; yet, they explicitly deny any problem with their fecundity. Can these women really be unaware of their circumstances? It seems plausible that they are misreporting their fecundity status for unknown reasons. Moreover, the User's Guide to the 1995 NSFG (7) cautions that this group may disproportionately include women who have had unreported abortions. Because these women cannot be confidently assigned to the fecund or subfecund group, they are excluded from the analysis.

Nonsurgically sterile women represent only 2% of the sample in all cycles, and they are not asked any questions on intentions. They too will be excluded from the analysis.

The four remaining categories are fecund, subfecund, contraceptively surgically sterile, and noncontraceptively surgically sterile. The latter two groups were not asked about their reproductive intentions, yet they cannot be discarded at once. Figure 1 plots the changes in overall fecundity status from 1982 to 1995, standardized by age, parity, and education as described previously. The 1982 distribution by age, parity, and education was used as the standard for all years. The size of each category changed somewhat in each survey round.

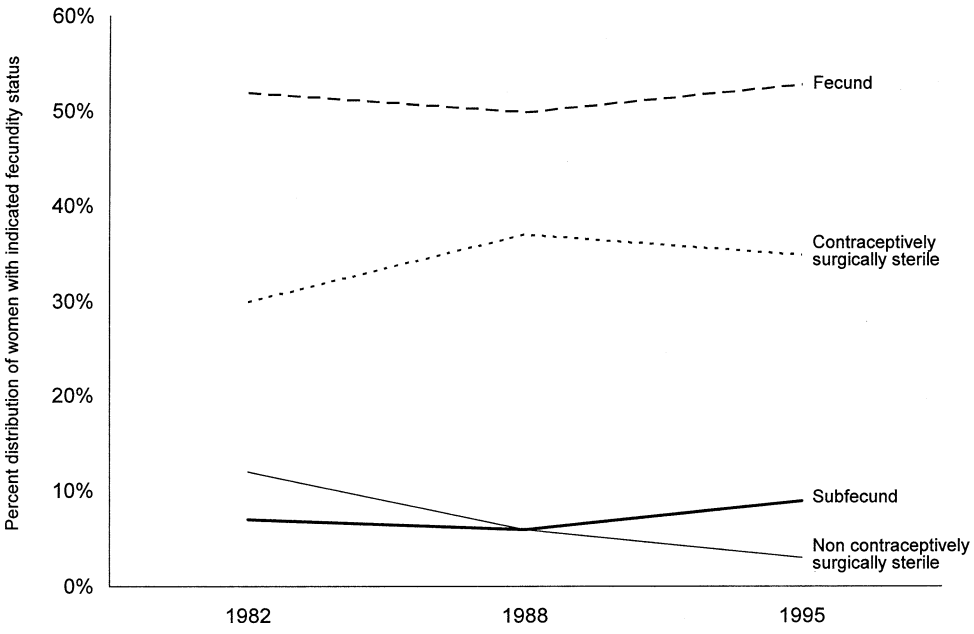
The rise and fall of the contraceptively surgically sterile group is troubling. These couples have decided against any future births, and they have opted for a highly effective contraceptive method. Although they were not directly asked if they intend a future birth, their choice of surgical sterilization reveals their plans. This suggests that the category of contraceptively surgically sterile should be included in the fecund group, and should be assumed to intend no further births.

Yet, this solution is problematic. It is impossible to know from this data whether the women who opt for surgical sterilization were subfecund or fecund before their procedure. The decline in noncontraceptively surgically sterile women between 1988 and 1995 is related to this problem. The decline in this category is not due to reduced incidence of medical problems, but marked decreases in hysterectomy and oophorectomy rates for common conditions such as endometriosis or fibroid tumors (8). How did these women with reproductive ailments classify themselves after 1982? Some may have entered the subfecund category, but the size of that group did not increase by nearly as much as the noncontraceptively surgically sterile group decreased. Between 1982 and 1988, it looks as though these women were entering the contraceptively surgically sterile group. That means that women with reproductive problems were choosing surgical sterility for contraception, and there is no way to identify them as having probably been subfecund before their sterilization.

If the contraceptively surgically sterile group is excluded, then the proportion of fecund women who intend a birth is affected by the popularity of sterilization as a contraceptive option. If the contraceptively surgically sterile group is in-

FIGURE 1

Percent distributions of women by fecundity status and survey year, standardized by age, parity, and education.



Miller. ART and birth intentions. Fertil Steril 2004.

cluded in the fecund category, then some subfecund women are being counted as fecund. To address this issue, the analysis will be run both ways. It is presented first and in detail with the contraceptively surgically sterile group excluded. Afterward, the analysis that includes the contraceptively surgically sterile group is discussed briefly. Both approaches reach the same substantive conclusion.

The noncontraceptively surgically sterile group is excluded entirely because they were not asked about their reproductive intentions. Because their surgery was medically indicated and not chosen as a contraceptive method, their intentions cannot be inferred from their fecundity status.

Study Conduct

The Code of Federal Regulations Title 45, section 46.101(b)(4) states that research is exempt from IRB review if it involves: the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens; if these sources are publicly available; or if the information is recorded by the investigator in such a manner that subjects cannot be identified either directly or through identifiers linked to the subjects.

This study is exempt from Institutional Review Board (IRB) review both because it uses existing and publicly available NSFG data, and because it could not identify individual subjects, either during data analysis or in this report.

The author holds no financial, personal, or material interest in the development of any form of assisted reproduction.

RESULTS

Table 1 includes the unweighted n's, weighted distributions, and weighted means for married women in each cycle of the NSFG, by fecundity status, age, parity, and education. It demonstrated that birth intentions among fecund women dropped from 55% to 52%, whereas among subfecund women they rose from 49% to 54%. On the surface, this supports the hypothesis.

Yet these changes could be due to differences in age, parity, and education between the groups. The rest of Table 1 shows that subfecund women are consistently older and have fewer children than fecund women on average. Subfecund women appear less educated than fecund women in 1982 and 1995, and somewhat more educated in 1988. The standardization for all three variables will account for these differences.

What are the rates of intending a birth by fecundity status, education, parity, age, and survey year (Fig. 2)? In 1982, slightly more women who were fecund intended a birth than subfecund women did at all levels of education. In 1988, differences between subfecund and fecund women narrowed, and by 1995 the proportion of subfecund women intending a birth significantly exceed that for fecund women,

TABLE 1

Characteristics of NSFG samples, by fecundity status and survey year.

	Fecund women			Subfecund women		
	1982	1988	1994	1982	1988	1994
Unweighted n	1,578	1,608	2,021	210	231	392
Birth intention (%)	55.2	55.2	51.9	48.7	51.6	54.2
Mean age (y)	29.2	29.7	31.4	31.3	32.6	34.0
Mean parity	1.51	1.34	1.37	1.29	1.09	1.21
Mean years of education	13.0	13.5	13.7	12.6	13.7	13.3

Note: NSFG = National Survey of Family Growth.

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among those with a high school education or less. The 1988 and 1995 crossovers in rates between subfecund and fecund women are negligible. Overall, less educated subfecund women's birth intentions seem to have risen faster than fecund women's. Changes in the rates of intending a birth by parity show a similar pattern. With time, subfecund women's birth intentions rose at all parities relative to fecund women.

The proportions by age show a crossover in rates in 1982 and 1988. In these 2 years, it was the older subfecund women whose birth intentions exceeded those for fecund women. By 1995, this crossover had disappeared because younger subfecund women had raised their birth intentions higher than fecund women.

The crossover in rates by age causes some difficulty for the standardization, especially in 1982 and 1988. Subfecund women are older than fecund women. If the age distribution of subfecund women is used as the standard distribution, then the standardized proportion intending a birth will be high because rates of intending a birth are higher at the older ages. If the younger age distribution of fecund women is used as the standard, then the standardized proportion intending a birth will be lower because the rates are lower among younger women. For this reason, the standardization is run using both the subfecund and fecund distributions from 1982, and the results are interpreted accordingly.

Figure 3 gives the standardized proportions by survey year. The standardizations for education and parity show an increase over time in the proportion of subfecund women intending a birth as compared to fecund women, although few of these differences rise to statistical significance. The choice of standard distribution for education and parity does not strongly affect these results. The standardization for age also shows an increase in subfecund women's birth intentions relative to fecund women, but the choice of standard affects the size of this rise. Yet in either case, the birth intentions of subfecund women are significantly higher when compared with fecund women by 1995.

When age, parity, and education are standardized at once, the choice of standard changes the results somewhat. Yet the substantive conclusion remains: birth intentions among subfecund women rose faster than that among fecund women, and the difference was especially stark between 1982 and 1995. Using the subfecund age distribution as the standard, birth intentions rose by 5 percentage points among fecund women and 13 points among subfecund women between 1982 and 1995. In other words, subfecund women's birth intentions rose 2.6 times faster compared with fecund women's birth intentions (13/5 = 2.6). Using the fecund age distribution as a standard, subfecund women's birth intentions rose fully 4.7 times faster compared with fecund women's intentions (14/3 = 4.7)

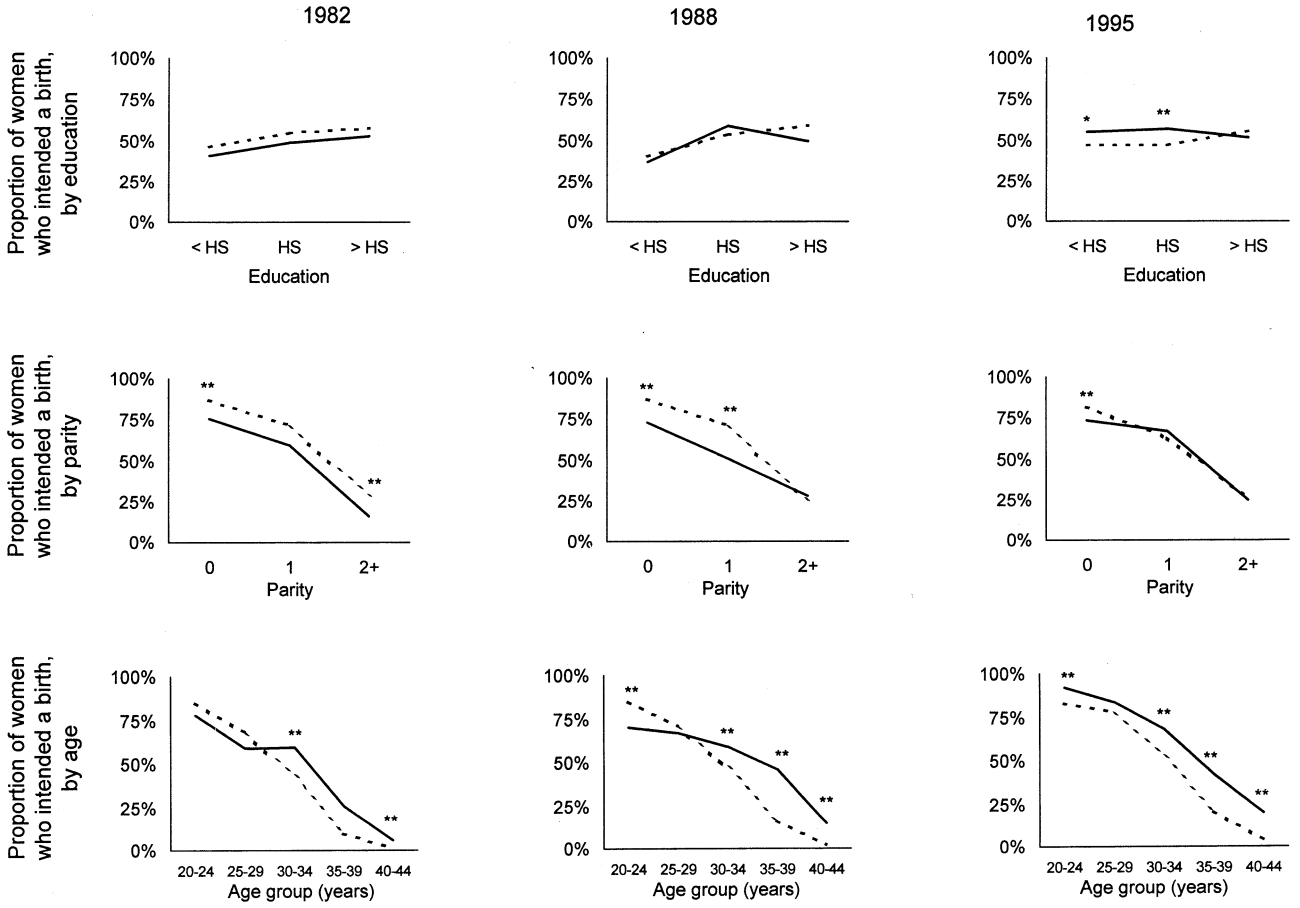
As discussed in the methods section, this result could have been driven by the exclusion of contraceptively surgically sterile couples. Nonetheless, when the analysis is rerun under the assumption that these couples are fecund and do not intend a birth (not shown), the substantive conclusions are exactly the same.

This result also could have been driven by rising age at maternity. The average age at maternity rose from 26.3 to 27.1 between 1982 and 1995 (9, 10), and subfecundity rises with age (11). As older women sought to become pregnant, more of them had difficulty, and more may have become aware of their subfecundity through this attempt. In these cases, it was the actual birth intentions that made women aware of their subfecundity. This may have inflated the proportion of subfecund women who intend a birth, entirely unrelated to ART.

This hypothesis can be tested with the NSFG data. Each round asked respondents whether they have ever sought medical services for achieving a pregnancy or avoiding a miscarriage. About half of subfecund women in each round answered "no." This subset of subfecund women who have never sought services for infertility must have become aware of their subfecundity when they sought treatment for some other reason. In this group, no relationship exists between the awareness of subfecundity and birth intention. This group can be compared with the fecund women who have

FIGURE 2

Proportions intending a birth, by age, parity, education, survey year, and fecundity status: Subfecund women (———); Fecund women (- - - -). Differences between fecund and subfecund proportions are statistically significant at *$P<.05$ and **$P<.01$. <HS = did not complete high school; HS = completed high school but no more; >HS = completed more than high school.



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never sought infertility services — about 90% of the fecund category in each round.

The entire analysis was rerun among women who have never been treated for infertility (not shown). Standardized for age, parity, and education, subfecund birth intentions rose dramatically relative to fecund birth intentions between 1982 and 1995, regardless of the standard distribution applied. Thus, the rise in subfecund birth intentions is not an artifact of rising age at maternity from 1982 to 1995. The increase in birth intentions even took place among women who have never sought treatment for infertility.

DISCUSSION

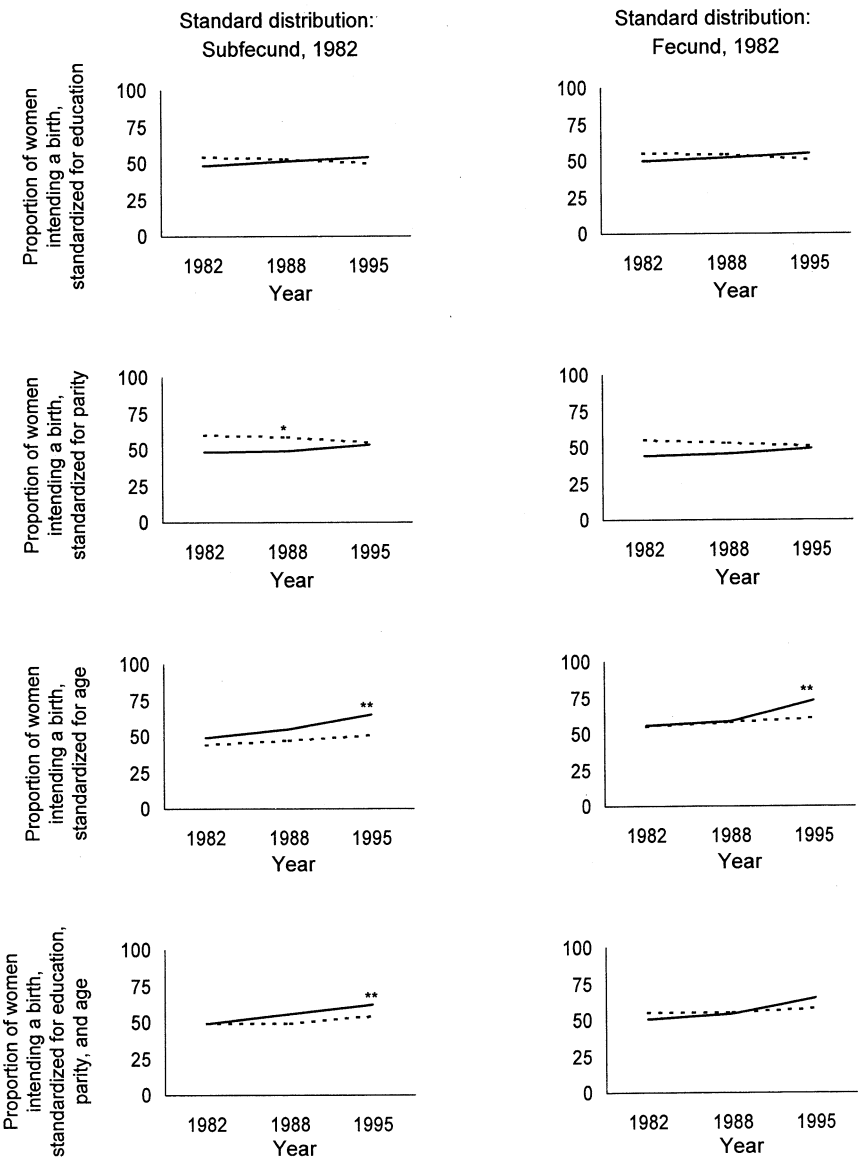
The development of ART presents a strong candidate for the cause of the rise in birth intentions among subfecund women between 1982 and 1995. The arrival of ART in the United States in 1981 caused a media sensation. Yet, among subfecund couples, simple awareness of ART through media coverage is probably not enough to translate birth desires into birth intentions. Assisted reproductive technology must also be perceived as geographically accessible, effective, ethical, and affordable. Each of these aspects of ART changed between 1982 and 1995; they will be discussed in turn.

Geographic Accessibility

In the year following the first IVF birth in the United States in 1981, at least nine other IVF clinics were opened at large private, public, or university hospitals around the country. Before 1986, no central registry existed for clinics practicing IVF. However, infertility specialists were often asked to estimate the number of clinics in media interviews, and

FIGURE 3

Standardized proportions of women who intend a birth: Subfecund women (———); Fecund women (- - - -). Differences between fecund and subfecund proportions are statistically significant at *$P<.05$ and **$P<.01$.



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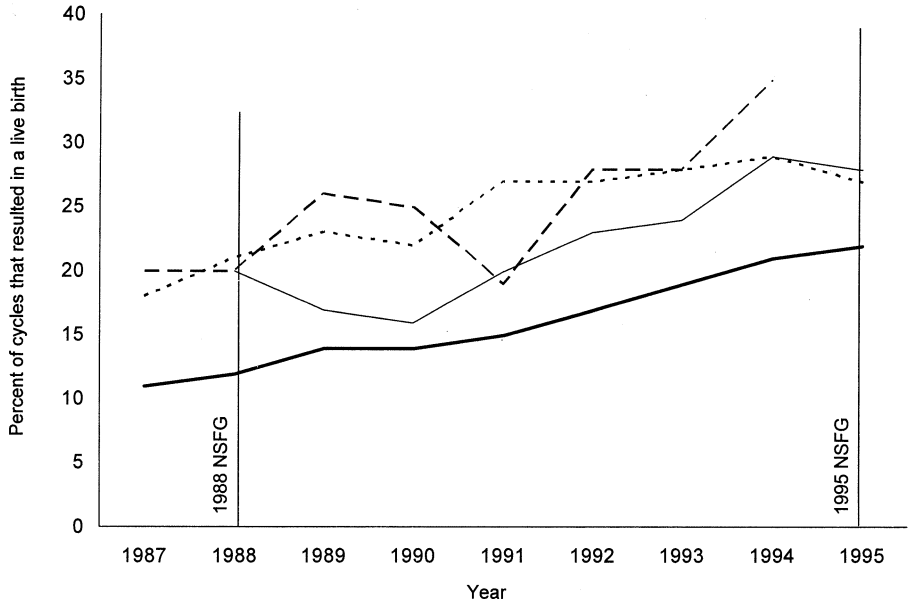
these estimates suggest a consistent growth in the number of clinics offering ART, to roughly 150 by 1989. In 1986, the American Fertility Society's Society of Assisted Alternative Reproductive Technology and Medical Research International established a voluntary registry of ART clinics, enrolling 41 clinics initially. This registry is currently known as the American Society for Reproductive Medicine/Society for Assisted Reproductive Technology (ASRM/SART) registry, and is run jointly with the Centers for Disease Control. Data from the ASRM/SART registry is published yearly in *Fertility and Sterility*. This registry shows that the total number of clinics grew steadily in the 1990's, and by 1995, there were 281 clinics offering ART.

In 1982, only nine states had an ART clinic, but the ASRM/SART reports show that by 1988, fully 42 states and the District of Columbia had at least one clinic. Growth in the number of clinics and clinics per capita was somewhat consistent in the northeast, west, and midwest regions, and a bit slower in the southern states. The steady growth in the

FIGURE 4

Percent of cycles that resulted in a live birth, by year and type of ART: IVF GIFT ZIFT Combination (- - - -). IVF (▬▬▬) = in vitro fertilization; GIFT (· · · ·) = gamete intrafallopian transfer; ZIFT (———) = zygote intrafallopian transfer; NSFG = National Survey of Family Growth.



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number of ART clinics and their swift distribution into almost all states shows that ART services became increasingly geographically accessible between 1982 and 1995.

Effectiveness

By the late 1980s, the main selling point of an ART clinic was its success rate, which varied widely by clinic. Because of the stress and expense of the procedure, customers became attuned to clinic success rates. This put pressure on clinics to produce encouraging statistics, which they did by selecting their highest rate from among the dozens of possible numerators and denominators. A spate of newspaper articles attested to confusing success rates and inflated claims.

By 1989, the consumer protection issues had become serious enough that the House Subcommittee on Regulation, Business Opportunities, and Energy of the Committee on Small Business held hearings on regulation of the industry (12). Popular coverage of these hearings was strong, and they eventually resulted in passage of the 1992 Fertility Clinic Success Rate and Certification Act, which required the Secretary of Health and Human Services to create a model certification program for administrative practices and laboratory standards at IVF clinics. It also created a standard definition of "success" — the percent of cycles that result in a live birth. In addition, the Centers for Disease Control (CDC) was directed to publish clinic-specific success rates that could be used by potential customers.

Refinements in ART techniques and the stricter regulation of clinics began to improve the success rates of procedures. Figure 4 plots the percent of ART cycles that resulted in a live birth, by year and type of procedure, as calculated in the annual ASRM/SART reports. The overall increase in effectiveness of all methods is obvious, although rates occasionally rose and fell for reasons that are not clear to ASRM/SART officials. By 1994, the success rate for a combination of procedures had reached 35%.

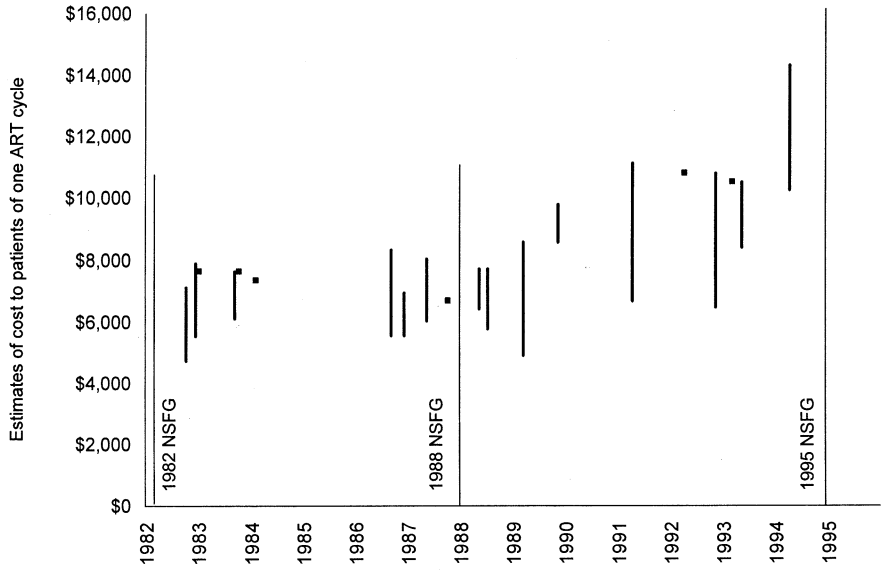
Ethics

How did individuals view the ethics of ART? In 1978 and 1994, two nationally representative surveys included similarly worded questions on general ethical support for IVF. In 1978, 60% of respondents supported the use of IVF among married infertile couples using their own egg and sperm (13), and by 1994, that number had risen to 76% (14). Unfortunately, no further detail on public opinion over the course of this period is available.

Yet detail on the vociferous public debate on ART is abundant (15). From the start, ART was drawn into abortion politics because antiabortion advocates claimed that any excess embryos that were not used in ART were effectively aborted. Other debates cropped up around the use of frozen

FIGURE 5

Estimates of cost to patients for one ART cycle, by year, adjusted to 1995 dollars. Vertical line indicates a range. NSFG = National Survey of Family Growth.



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embryos or surrogate mothers, who bore children to whom they were not genetically related. The Vatican explicitly banned the use of IVF in 1987, but by the early 1990s, many Catholic hospitals were openly defying the church (16). Meanwhile, the federal government under the Reagan administration and the first Bush administration would not fund research into ART for ethical reasons (17).

Unconventional mothers began requesting ART in the early 1990s. Births among women in their 50s and even 60s (18) triggered heated public debate about the appropriate age for motherhood. The first single women, lesbians, and widows who wanted to get pregnant with donated sperm or frozen embryos added to the debate and forced clinics to generate their own eligibility guidelines (19). Yet, as ART was applied in unusual circumstances, its acceptability among "proper" mothers — married, heterosexual, premenopausal women who could afford it — became taken for granted. In February 1994, the Clinton administration recognized this by assembling an ethics board at the National Institutes of Health (NIH), which eventually recommended that several forms of embryonic research be federally funded, including ART.

To summarize, the ethical acceptability of ART did not arise smoothly. After the conspicuous introduction of ART in the early 1980s, vehement ethical debates arose quickly and dominated much of the 1980s. The NSFG cycle carried out in 1988 took place in the midst of these debates. By the 1995 NSFG cycle, however, the use of ART as an infertility treatment was largely considered ethical.

Affordability

Figure 5 presents clinic directors' estimates, drawn from various media articles, of patient fees for one ART cycle, adjusted to constant 1995 dollars. Because several cycles are often necessary to produce a live birth, total costs to a couple could exceed these estimates by several times. Couples who use ART have always been disproportionately wealthy compared with other subfecund couples, and high fees undoubtedly play a role in that selectivity. However, Chandra and Stephen's (4) analysis of service-seeking among women with impaired fecundity, using NSFG data, demonstrated that between 1982 and 1995, the use of infertility services among the poorest women increased much faster than among the wealthiest.

Why would relatively poor women seek more services while the costs of ART rose? One reason is the rise in insurance coverage for infertility services, including ART, which occurred between 1988 and 1995. Before 1981, explicit insurance coverage for infertility treatment was unknown. More common was coverage for underlying conditions that cause subfecundity, such as endometriosis. When the first claims for IVF were submitted to insurance carriers in the early 1980's, they were universally rejected, mainly because the procedure was deemed experimental and not medically necessary (20). Starting in 1985, a few state leg-

islatures began mandating full or partial coverage for infertility services. Meanwhile, couples in other states whose IVF costs had not been reimbursed filed successful class action lawsuits against insurers. Eventually, insurers began offering coverage voluntarily. This rise in health insurance coverage for infertility took place mostly after 1988.

CONCLUSION

The 1982 NSFG took place when IVF was a novel, experimental technique of questionable ethical status that was offered at handful of hospitals around the nation and not covered by health insurance. At that time, the proportions of subfecund and fecund women intending to have a birth were roughly comparable, net of differences in age, parity, and education.

Although by 1988, several new procedures had expanded the techniques of ART and new clinics had sprung up in 42 states, ART was portrayed in the media as being largely ineffective, and ethical debates raged. Costs of the procedures remained fairly stable, but insurance coverage was slight. The late 1980s witnessed the height of concerns about exploitation of customers by unscrupulous ART clinics. By 1988, subfecund women's birth intentions had risen only slightly compared with fecund women. By 1995, the ethical standing of ART had improved, clinics were closely regulated, insurance coverage had expanded, and success rates, now measured accurately, had risen. By this time, birth intentions among subfecund women had soared relative to fecund women. This constellation of events strongly suggests that the rise in subfecund women's birth intentions was caused by the development and expansion of ART.

Demand for ART services has been high since their inception, and if this analysis is correct, may rise even higher. Since 1995, ART services have become even more effective, geographically accessible, and ethically acceptable, perhaps leading to further increases in subfecund women's birth intentions. For this reason, projections of future demand that incorporate current rates of use may be underestimated.

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References

1. Stephen E, Chandra A. Updated projections of infertility in the United States: 1995–2025. Fertil Steril 1997;70:30–34.
2. Miller W. Reproductive decisions: how we make them and how they make us. Advances in Population 1994;2:1–27.
3. Potter F, Iannacchione V, Mosher W, Mason R, Kavee J. Sample design, sampling weights, imputation and variance estimation in the 1995 National Survey of Family Growth. National Center for Health Statistics, Vital and Health Statistics 1998;2(24).
4. Chandra A, Stephen E. Impaired fecundity in the United States: 1982–1995. Fam Plann Perspect 1998;30:34–42.
5. Williams L. Determinants of couple agreement in U.S. fertility decisions. Fam Plann Perspect 1994;26:169–173.
6. Kelly J, Mosher W, Duffer A, Kinsey S. Plan and operation of the 1995 National Survey of Family Growth. National Center for Health Statistics, Vital Health Statistics 1997;1(36).
7. National Center for Health Statistics. Public use data file documentation: National Survey of Family Growth, cycle 5: 1995, user's guide. National Center for Health Statistics, Centers for Disease Control and Prevention, Public Health Service, U.S. Department of Health and Human Services: Hyattsville, Maryland, 1997.
8. Chandra A. Surgical sterilization in the United States: prevalence and characteristics, 1965–1995. National Center for Health Statistics, Vital Health Statistics 1998;23:1–33.
9. National Center for Health Statistics. Vital statistics of the United States, 1982, volume 1–natality. U.S. Department of Health and Human Services, Public Health Service, National Center for Health Statistics: Hyattsville, Maryland, 1986.
10. National Center for Health Statistics. 1995 Natality vital rates provided to author. Hyattsville, Maryland, 2001.
11. Rahman O, Menken J. Age at menopause and fecundity preceding menopause. In: Gray R, Leridon H, Spira A, eds. Biomedical and demographic determinants of reproduction. Oxford, England: Clarendon Press, 1993:65–84.
12. House Commitee on Small Business. Consumer protection issues involving in vitro fertilization clinics, hearing March 9, 1989. Washington DC: Subcommittee on Regulation, Business Opportunities and Energy. Congressional Session 101-1. CIS-NO: 89-H721-30. 1989.
13. Gallup Organization. Gallup Poll-Aipo. August 4–7, 1978.
14. Princeton Survey Research Associates. High-technology fertility survey. May 24–31, 1994.
15. Singer P, Wells D. Making babies: the new science and ethics of conception. New York: C. Scribner's Sons, 1985.
16. Stack P. Religion column. *The Salt Lake Tribune*, June 18, 1994;C1.
17. de Melo-Martin I. Making babies: biomedical technologies, reproductive ethics, and public policy. Boston: Kluwer Academic Publishers, 1998.
18. Stolberg S. Science helps Italian woman give birth at 62. *Los Angeles Times*, July 19, 1994;A1.
19. Leiblum S, Williams E. Screening in or out of the new reproductive options: who decides and why. J Psychosom Obstet Gynaecol 1993; 14(Suppl):37–44.
20. King L, Meyer M. The politics of reproductive benefits: US insurance coverage of contraceptive and infertility treatments. Gender and Society 1997;11:8–30.