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Babies in waiting: Why increasing the IVF age cut-off might lead to fewer wanted pregnancies in the presence of procrastination

Paul Dolan, Caroline Rudisill*

Department of Social Policy, London School of Economics & Political Science, UK

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ABSTRACT

Despite the best of intentions, we often act at the last minute when we are faced with a deadline. A recent recommendation by the English National Institute for Health and Clinical Excellence (NICE) to make In Vitro Fertilisation (IVF) available to women up to 42 years of age instead of 39 intends to offer more women the chance of pregnancy. Given what we know about behavioural responses to what is, in essence, a deadline, the policy could lead to procrastination and fewer wanted pregnancies. We examine how many women it would take to delay trying for a baby for this policy to result in fewer pregnancies. We take a cohort of 1000 women from age 34. If no women delay trying, the increased age on access to IVF results in 31 more pregnancies. Because of declining fertility with age, it would take only about a third of these women to delay trying for a baby until age 35 for there to be zero net benefits of increased IVF availability. If all women delayed by a year, the new policy will lead to 59 fewer pregnancies. We also estimate the implications for IVF treatment numbers as this has psychological and personal consequences. Our findings highlight how no policy sits in a behavioural vacuum and all policy decisions should consider the likely behavioural responses and incorporate them into their design and evaluation.

1. Introduction

What do we do when we face a deadline for a task we know we should complete? The evidence from behavioural science tells us quite clearly that many of us will procrastinate and avoid paying attention to the task until the last minute [1]. We are especially likely to procrastinate over purposeful activities such as studying or working [2]. While neoclassical economics would assume that decision-making is based on considering the discounted flow of costs and benefits, there are many well-established biases impacting this process. In some contexts, preference structures tend to be biased towards the present and immediate rewards because of hyperbolic discounting (e.g. credit card debt). Hyperbolic discounting leads to procrastination where we continually choose to delay a task that requires completion in favour of more immediate benefits [3]. Self-imposed deadlines can help with this bias but, because we are overly-optimistic about our abilities to start and complete tasks, they are not as effective as externally set deadlines [4].

Procrastination can have potentially negative impacts on policy aims as well. The National Institute for Health and Clinical Excellence (NICE) in the UK recently announced

* Corresponding author at: Department of Social Policy, London School of Economics & Political Science, Houghton St, WC2A 2AE, UK.
Tel.: +44 20 7955 6574.
E-mail address: a.c.rudisill@lse.ac.uk (C. Rudisill).

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in February 2013 that the cut-off age for In Vitro Fertilisation (IVF) treatment will be raised from 39 to 42. This change aims to offer more women the opportunity to have a pregnancy. Pregnancy could fall into the category of a purposeful activity, and so it is a behaviour that is likely to be affected by procrastination. Individuals thinking about starting a family would tend to want to avoid immediate costs (e.g. foregoing career advancement, not meeting financial goals) given the ability to put off these costs into the future. Moving a deadline further into the future means that the costs of immediate delay are reduced.

Given what we know about how human behaviour responds to what is, in essence, a deadline, increasing the age up to when IVF will be available on the National Health Service (NHS) may simply shift upwards the age at which women begin trying for a baby. And given that fertility rates and IVF success rate fall with age (Supplementary Fig. 1), the consequence of this behavioural response may mean fewer wanted pregnancies rather than more. Moreover, women engaged in fertility treatment tend to be relatively informed consumers and thus are likely to be aware of this policy and prone to procrastination as a result.

Any policy-maker, including NICE, should be interested in the behavioural implications of its policies and consider how well established behaviours and biases might lead to unintended policy consequences. Some of these unintended consequences might be mitigated if NICE were to formally consider behavioural criteria when assessing policy options and their implementation. In particular, behavioural factors can drive parameter uncertainty in evaluation. This policy stands as more likely to achieve its aims if accompanied by interventions aimed at the predictable behavioural response to the extended deadline, which would help women take more seriously the risks associated with delaying childbearing.

We do not yet know the number of women who might delay pregnancy, and so we examine how many women it would take to delay pregnancy for the new IVF policy to provide the same or even fewer number of live births for women. We examine the incremental benefits of the new versus the old NICE fertility guideline using scenario modelling. The key question is how many women delaying when they start trying to conceive does it take for the new fertility guidelines to actually result in fewer live births. As a secondary outcome measure we examine the difference in the person years in IVF under each policy scenario.

2. Policy context – and behavioural response

Following the recent recommendations by NICE, IVF will now be available to women up to 42 years of age, increased from the previous cut-off of 39. The treatment also will be offered for women who have been naturally attempting to conceive for two rather than three years [5]. This update on 2004 NICE guidance about fertility continues to suggest three IVF cycles for women up to 39 and now recommends one cycle for women 40–42 [6]. The rationale for increasing the maximum permissible age for NHS-funded IVF treatment is that, given improvements in IVF success rates over the past decade, offering IVF for patients aged up to 42 is now cost-effective (but the faster decline in IVF success rates for women aged 40 and above makes only one cycle of IVF cost-effective [7]).

Seven European Union countries have fixed upper limits on the age at which IVF will be covered by public health care. The average age is 42 years while the UK (among other countries) did have the lowest limit at 39 while Greece has the highest at 49. Austria and Germany restrict IVF based on a man's age as well, which adds even more interesting dynamics beyond the scope of this article [8].

The likelihood that these changes will achieve the goal of more women having the opportunity of a pregnancy depends critically on how people respond to the increased age cut-off for IVF. The average age for IVF in the UK increased from 33 in 1992 to 36 in 2007, which is in line with the general shift upward of the average childbearing age [9]. Not all women are fully aware of the extent to which fertility declines with age [10] or the potential health consequences of delayed childbearing on infant outcomes [11]. Misperceptions about how fertility declines with age have been found among men and women with higher education qualifications [12]. Even when women have been found to be aware of the risks associated with delaying pregnancy, many think that IVF reverses age-related fertility challenges [13]. It cannot be assumed that people will to take into consideration all the risks and benefits associated with alternative decisions.

Existing evidence comparing US states that have mandates to reimburse infertility treatment with those that do not found a positive association between coverage and average age of first birth. This is suggestive of a delay related to coverage but this does not prove causality of course [14]. Even with full awareness of all the risks and benefits associated with childbearing age decisions, preferences about pregnancy timing present a complex decision-making problem. Like women, men also might also wish to delay having children for career and personal aspirations but the evidence suggests that childbearing has no effect on men's wages while it does impact women's [15]. Many women and men would receive a benefit from having IVF access up to age 42, regardless of the reasons behind delaying to have children. While this policy provides a benefit, it also introduces added costs associated with an ever-increasing probability of not conceiving and the related disutility.

3. Methods

3.1. Study design

We analyse this issue as a policymaker might wish to do so: assessing whether and by how much two important outcomes – number of live births and number of person years in IVF – differ across two policy options. The study design is one of scenario analysis where we take a cohort of 1000 women and model their behaviour starting at age 34 using parameters from the literature.

3.2. Input data

Our model inputs and their sources appear in Supplementary Table 1. The data sources are peer-reviewed

literature for likelihood of conception according to age, the Human Fertilisation & Embryology Authority for IVF birth rate figures according to age and the Office of National Statistics for likelihood of cohabitation or marriage according to age. Given these parameters, we examine a variety of scenarios and their implications for the number of pregnancies for women 34–42. This study has no external funding source.

3.3. Scenario model

Of these 1000 women, we only consider those who are married or cohabiting eligible to be planning for pregnancy [16]. Each year, women have a natural conception likelihood dependent on their age [17]. Under the previous guidelines, if we assume that all women who are either married or cohabitating delay until the last minute when they could first start IVF treatment, they would start trying to conceive naturally at 34. This would give them two years until they would be eligible for NHS-funded IVF treatment at age 36 (assuming no existent fertility problems known beforehand [5]).

We assume that all women who reach the age of 36 years and have not had a pregnancy yet would elect to undergo IVF. This overestimates the actual number who would have IVF as some women would choose not to have the treatment or might not be eligible for health reasons.

IVF success, measured as live births per cycle started using fresh eggs, varies by age [18]. We assume that once women start IVF, they will continue to undertake IVF one time per year until they are no longer eligible by age and they use their own fresh embryos. On the one hand, this underestimates the benefits of IVF since some women might have more than one cycle per year while on the other hand, it overestimates the benefits of IVF since some women may refuse IVF treatment, or stop after only one cycle. It also avoids the issues of at what age a second or third cycle might take place.

Pregnancies are not the only matter of concern here. IVF is a difficult process not only physically but also psychologically. As a result of the new guidance, more women will have access to IVF than before but more women might also feel the need to undergo IVF because of delays in pregnancy efforts. We can examine these issues by estimating the number of person years in IVF for women up to 39 under the 2004 guidelines versus the 2012 guidelines.

3.4. Simulation

We examine a number of scenarios; when no women delay trying for a baby (Scenario A), a threshold analysis of what percentage of women it would take to delay for one year for there to be no additional benefits in terms of the number of live births because of this policy (Scenario B), how many fewer births would take place if 50% of women delayed for 1 year (Scenario C), how many fewer births would take place if all women delayed for one year (Scenario D) and how many fewer births would take place if 50% of women delayed in the first 2 years (Scenario E). We also estimate what these scenarios would mean for the number of person years in IVF.

3.5. Sensitivity analysis

The live birth rate for fresh eggs is usually higher than that for frozen embryo transfers but in older women the opposite is true (13.9% of frozen embryo transfers using a woman's own eggs result in live birth versus 13.6% using fresh eggs for women 40–42 years). The overwhelming majority of IVF uses fresh eggs (81% in 2011) [18]. We elected to simplify our model using only live birth rates for this type of IVF. We undertake sensitivity analysis where women switch to frozen embryo transfers at 40 years to test the robustness of our findings.

4. Results

4.1. Number of live births

If we assume that once women turn 36 and they have not conceived naturally then they will undertake IVF, for a cohort of 1000 women who would attempt to conceive naturally from 34 to 35 and then start IVF at 36, continuing until 39, there would be 885 live births (Fig. 1).

Under the new guidelines, given the same set of assumptions but with a longer period where women could try IVF, there would be 916 live births. This would be an added 31 live births as a result of the age extension (Scenario A). Therefore, 31 new live births would have been able to occur because of the extended age criteria.

We then undertake a threshold analysis to see how many women it would take to delay starting their efforts to conceive naturally from age 34 until age 35, for there to be zero benefits of these added years of IVF (Scenario B) versus the previous policy to find that it would only take 35%. Sensitivity analysis around the percentage of those who delay trying demonstrates the extent to which delay impacts the number of live births. If 50% of 34-year-old women wait for a year under the new NICE guidelines, then 14 fewer live births occur (Scenario C) but in the extreme, if all 34-year-old women decide to wait a year, 59 fewer live births occur (Scenario D). If 50% of 34 and 35 year old women wait for a year, then 73 fewer live births occur (Scenario E).

4.2. Number of person years in IVF

The difference in person years in IVF ranges from 0 (Scenario A) to 677 more years of 1000 women's lives between ages 36 and 39 spent in IVF (Scenario E). These figures present an overestimate of how many women would actually undertake IVF for such a long time since many might only have one cycle, or opt out entirely, deciding not to go through assisted reproduction or try to continue to conceive naturally for longer and wait until beyond the minimum NHS-funded age of 36. Given that we treat the 1000 women in each scenario identically, this comparative analysis still provides a useful reference point (Fig. 2).

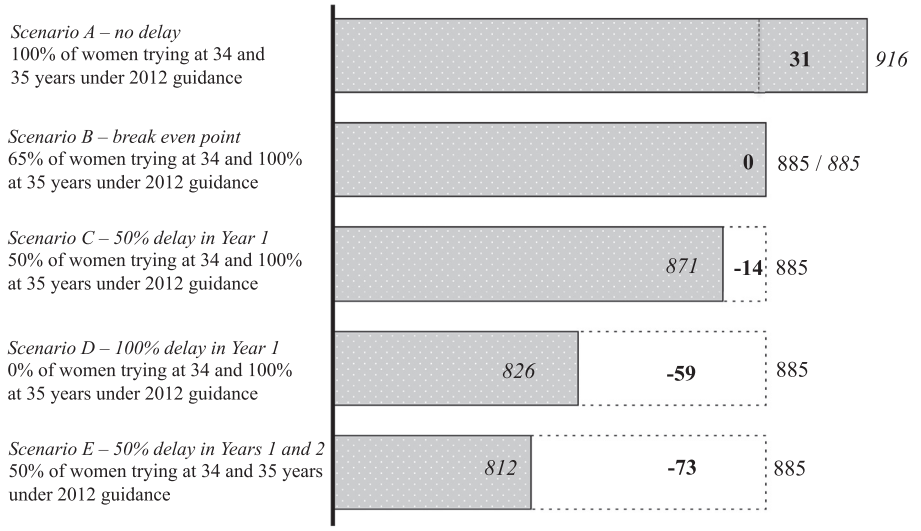

Fig. 1. Differences in number of live births for behavioural scenarios.

4.3. Sensitivity analysis

If we assume that women switch to frozen embryo transfers from the age of 40, it would take 36% rather than 35% of women delaying trying for pregnancy when they are 34 years for there to be the same number of live births from this policy as the previous one.

5. Discussion

The intention of NICE's guideline appears to be exactly the opposite of what the policy might achieve. If the goal is truly to increase the amount of women who have children, this change in policy directly helps only those women who do not have a partner until they are between 40 and 42 or have decided that they wish to undergo IVF without a partner during the same age range. For women age 39 and below, this policy simply puts in place an incentive for them to delay pregnancy. It does not take much of a change in women's behaviours regarding planning pregnancy for the extension of IVF eligibility to actually result in fewer live births, rather than more. These results point to the importance of considering the likely behavioural responses to any new policy [19].

This analysis has limitations associated with the number of complexities involved in predicting successful pregnancies, personal choices about whether and when to undertake IVF and if so, how many cycles and when to undergo these cycles. The reasons behind accessing IVF may have nothing to do with age and everything to do with existing fertility problems in women, men, both or be of unknown origin. The argument still holds, however, that

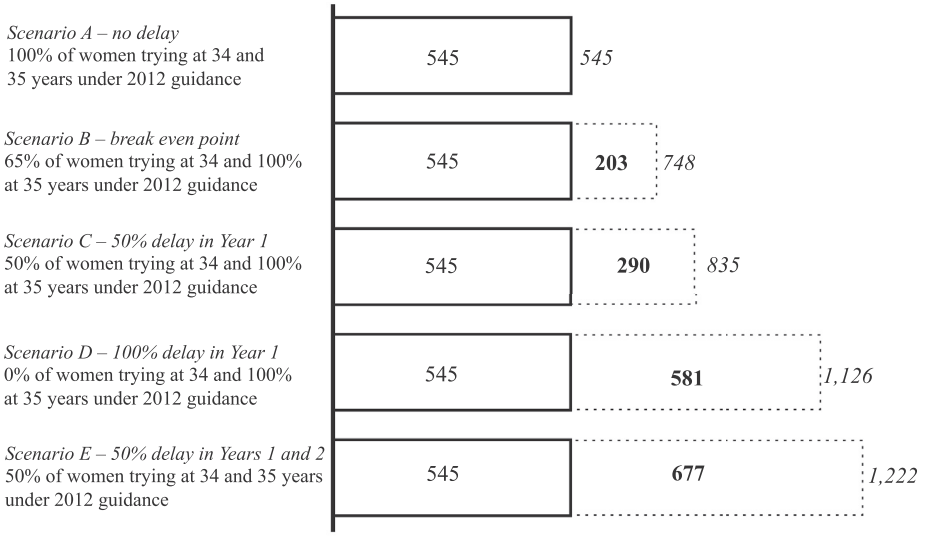

Fig. 2. Number of IVF person years for behavioural scenarios, 36–39 years of age.

the discovery of such problems and the possibility that IVF might be an appropriate treatment would lead to more successful outcomes in younger patients than in older ones. If IVF success rates improve then any possible delays in pregnancies attempts might be reduced.

Individuals wishing to become parents also have a number of other options apart from IVF such as adoption, surrogacy and foster care so we cannot assume that every couple would choose IVF. This study exclusively examines the group of women who wish to gestate their own child and clinically qualify for IVF treatment.

We also do not include estimates of how miscarriage rates would alter these pregnancy figures. The positive relationship between miscarriage likelihood and a mother's age would only further support our argument that encouraging the postponement of pregnancy through policy would result in fewer actual pregnancies [20].

Childlessness presents a psychological burden to couples that this policy aims to ameliorate. This analysis could be further extended using a quality of life/wellbeing outcome measure rather than number of live births and years in IVF. This would capture the detriment to wellbeing associated with childlessness and stress from fertility treatments [21]. While patients wishing to have a child will surely be pleased with this policy on the surface, they might actually be made worse-off by being allowed to procrastinate in ways that affect their chances of having a baby. Therefore, the behavioural implications of this policy should at least be incorporated into its rollout. Since the age limit for IVF has been raised, providing better and more salient information about the risks associated with waiting until later to try for a baby might go some way towards preventing further procrastination. In this way the policy might be able to both increase opportunities for patients in need of services up to age 42 who have no alternative and also give those who could have begun trying at a younger age, a higher likelihood of success.

As part of its decision-making process, NICE might also undertake sensitivity analysis around possible behavioural responses, like procrastination, in order to determine whether and the extent to which these responses might alter expected policy outcomes. Procrastination certainly is pervasive: from students completing a project about a day before deadline (when they are over-optimistically estimate that they will be done about four days ahead of schedule [22]) to doctors evaluating more patients per hour and having more patient contact on 9 h shifts as opposed to 12 h ones [23].

By considering how humans are likely to respond to policy changes, policy-makers can then consider how best to deal with the behavioural responses. In the very least, an information programme advising on fertility rates by age should accompany the new age limit on IVF. It is now well established that much of our behaviour simply comes about rather than being thought about: that is, we respond in largely automatic and unconscious ways to cues in our immediate environment [24]. As a result, policy makers also need to consider ways in which to nudge people in particular directions. For example, as voluntary commitments encourage a later behaviour, women could be encouraged to consider making promises to their family and friends to start trying for a baby at a particular time [19].

Considering the behavioural responses to any policy change, and encouraging policy design that incorporates predictable human reactions, would contribute towards efforts for true evidence-based policy and enhance human welfare.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.healthpol.2014.09.009.

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