

**Will fertility of Danish women remain stable due to assisted reproduction?
Assessing the role of assisted reproduction in sustaining cohort fertility rates**

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Abstract:

Despite fertility postponement which has narrowed their time span available for reproduction Danish women born in the 1950s experienced a slight increase in their mean number of children. However, the negative effects of delayed childbearing on fertility rates may be more pronounced for women born in 1960s and 1970s, who have further shifted childbearing towards higher ages. For these cohorts, broad availability and widespread use of assisted reproductive technologies (ART) could become one of the most prominent factors preventing a decline in their completed fertility. To explore this idea, we analyse and project cohort trends in total and ART-related fertility rates, using register data on births and ART treatments among native Danish women born in 1960-1978. This analysis focuses on in vitro fertilization (IVF) and intracytoplasmic sperm injection (ICSI) and excludes intrauterine insemination (IUI). Our projections show that women born in the 1970s are likely to retain fertility rates that are relatively close to the replacement-level threshold. In line with our reasoning, the projections indicate that the continuation of relatively high and stable fertility will be sustained by a rapid rise in the use of assisted reproduction technologies. The projected proportion of children born after ART treatment shows a substantial increase from 2.5 percent among women born in 1965 to 5-6 percent among women born in 1978.

1 INTRODUCTION

Denmark is one of few European countries where completed cohort fertility did not decline among the women born during the 1950s and the early 1960s. To the contrary, Danish women born between 1956 and 1968 actually experienced a slight increase in their mean number of children, from 1.84 to 1.94 (Council of Europe 2006; a small fraction of the latter indicator is estimated). In parallel, period total fertility rate in Denmark increased considerably since 1983, when it reached a trough of 1.38 and later has stabilized above the level of 1.7 since the early 1990s, reaching 1.8 in 2005. This increase occurred despite ongoing fertility postponement, which has narrowed their time span available for reproduction. Thus, Denmark can be considered a ‘success’ case of a strong recuperation of delayed childbearing: women that increasingly reduced their fertility rates at younger ages have subsequently shown a strong tendency to increase their childbearing rates later in life, especially after age 28 (Frejka and Sardon 2004).

Period fertility indicators indicate that the trend of delayed parenthood, which started in the early 1970s, still continues, albeit with diminished intensity. In 2005, Danish women entered motherhood at age 28.5 years on average, i.e., by 4.6 years later than in 1970. Since 2003, women above age 30 account for more than half of the total fertility rates. Most rapid rise in fertility rates took place among women aged 35 and older: between 1980 and 2005 fertility rates at ages 35-44 increased by a factor of 3.2 and their share on the total fertility surged from 5.9 to 16.3 percent (own computations based on Eurostat 2007). Thus, more women postpone childbearing until their late thirties and early forties, when they face increasing infertility (ESHRE 2005, Leridon 2005). Although period trends suggest that fertility level is relatively stable and the data on fertility intentions show that intended family size remains above the replacement level of 2.1 (Testa 2006), younger cohorts of women in Denmark may find it increasingly difficult to realize their desired family size in the future. Consequently, a further shift towards later childbearing may lead to a decline in completed fertility among women who are now in the middle of their reproductive span.

Arguably, assisted reproduction technology (ART) may partly offset the negative effect of delayed childbearing on aggregate fertility rates. A computer simulation model employed by Leridon (2004) suggests that for women who postpone their first attempt to achieve pregnancy from age 30 to age 35 the use of in vitro fertilization (IVF) can make up for half of the births ‘lost’ due to declining conception rates. In Denmark, the use of assisted reproduction, especially of the IVF and ICSI (intracytoplasmic sperm injection), has risen steadily during the last two decades and the proportion of children born after an ART treatment reached 4.2 percent in 2002 – the highest figure among European countries with complete national register (Andersen et al. 2006, Table II; see also Andersen and Erb 2006). Including intrauterine inseminations, at least 6 percent of Danish infants were born after an ART treatment in 2002.¹ This high share of ART births can be partly attributed to the fact that assisted reproduction in Denmark is provided free of charge to women below age 40 who do not have a child with their current partner (up to three cycles are paid)² and is easily accessible at public clinics within the National Health System (Andersen and Erb 2006). According to the study published in 1996 infertile couples in Denmark were seeking medical infertility treatment more frequently than in other four European countries studied (Olsen et al. 1996). In addition, poor semen quality and rising infertility among younger cohorts of Danish men (Jørgenssen et al. 2002, Jensen et al. 2002, Jensen et al. 2007) may also contribute to the increasing use of ART.

¹ This figure includes officially reported intrauterine inseminations (IUI) and does not provide any adjustment for the possible underreporting of the IUI treatments in private medical establishments.

² In addition, several regions also fully subsidise the provision of ART for women who already have one child with their partner (reference xxx).

These figures indicate that a small, but rapidly increasing share of cohort fertility in Denmark will be achieved thanks to ART treatments. The widespread use of ART may be one of the most prominent factors keeping completed fertility of Danish women relatively high and stable in the future despite further increase in their age at entering parenthood. To explore this hypothesis, we analyse and project cohort trends in total and ART-related fertility rates, using register data on births and ART treatments. This analysis inspects trends in ART fertility rates by age, specified for first and total births, and their impact on reducing childlessness and sustaining cohort fertility. We focus on women born in 1960-1978, i.e., cohorts who are currently in their prime childbearing age or in the late stage of their reproductive period. Our study includes data on in vitro fertilization (IVF) and intracytoplasmic sperm injection (ICSI), two methods which cover more than 90 percent of all ART deliveries in Denmark (see the next section).

In order to analyse a relatively homogenous population, unaffected by migration, our study focuses on fertility history of 'native' Danish women, i.e., women of Danish nationality who were born in Denmark. In correspondence with the prominent role of fertility postponement for recent shifts in fertility rates in Denmark, our projection scenarios are closely linked with the scenarios of further fertility postponement and the assumed extent of the 'recovery' of the previously delayed childbearing. In the absence of any specific information on the possible impact of worsening male reproductive health on fertility rates of Danish women we do not incorporate additional scenarios capturing possible effects of increasing sub-fertility among men³. In this sense, our projections of trends in ART and their impact on fertility rates are rather conservative.

2 DATA

We analyse register data from several sources, which provide complete (in the case of births) or almost complete (in the case of population data and ART treatments) records on births, assisted reproduction and population in Denmark. To compute fertility rates we linked data from the registry of births in 1973-2003 with the registry of resident population in Denmark, provided by Statistics Denmark. We included in our analysis all women who have Danish parents, were born in Denmark between 1960 and 1978 and were resident in Denmark as of January 1, 2004. This eliminates possible impact of migrants on the overall fertility trends. In total, our records contain 651,790 women of whom 452,560 (69 %) have become mothers by the end of 2003.

We linked births and population data with the data on ART treatments, provided by the National Board of Health. These data, covering ART treatments since 1994, do not enable us to reconstruct a complete history of ART cycles for Danish women born after 1960. First, some women born in the early 1960s received infertility treatment before 1994 and are not registered in the database. Thus, our analysis underestimates the proportion of ART births and the impact of ART on fertility among women born until the mid-1960s. In addition, we only have records on the first initiation of an ART cycle for each person that has received this treatment between 1994 and 2003. In our analysis we assume that all births born to a woman ever undergoing an ART treatment result from assisted reproduction if they occurred after the initiation of her first ART cycle. This assumption leads to a slight overestimation of ART births, as some women achieve pregnancy through sexual intercourse even after they have used ART.

Finally, our study excluded other ART procedures than IVF or ICSI, namely intrauterine inseminations (IUI) and frozen embryo replacements (FER). Whereas FER accounted only for

³ However, we discuss the possible implications of an increasing infertility among men for fertility and ART-fertility trends among Danish women in the concluding section.

0.3 percent of all children born in Denmark in 2002, IUI are estimated to account 2.0 percent of all births (Andersen and Erb 2006; this figure is 1.8 percent when only the registered cases are included – see Table 1). Although IUI treatments are included in the national reporting system, we do not use these data in our analysis. Differently from ART, IUI treatments are frequently provided in private medical establishments and their reporting is not obligatory. Table 1 gives an overview of the number of treatments, deliveries and children born following the use various methods of ART and IUI in Denmark in 2002.

Table 1: Basic overview of ART and IUI cycles, deliveries, and births in Denmark in 2002

	Cycles	Deliveries	Deliveries per cycle (%)	Total live births	Live births per delivery	% ART cycles	% ART births	Share on total births (%)
IVF + ICSI	9630	1989	20.7	2458	1.24	85.1	91.9	3.84
FER	1543	168	10.9	197	1.17	13.6	7.4	0.31
ED	148	21	14.2	(21)	n.a.	1.3	0.8	0.03
ART total	11321	2178	19.2	2676	1.23	100.0	100.0	4.18
IUI	7932	1021	12.9	1146	1.12			1.79
ART+IUI	19253	3199	16.6	3822	1.19			5.96

Data source: Andersen et al. 2006

Notes: Acronyms are used as follows: ART for assisted reproduction; IVF for in vitro fertilisation; ICSI for intracytoplasmic sperm injection; FER for frozen embryo replacement; ED for egg donation; and IUI for intrauterine insemination

1) For egg donations, only the number of deliveries was published and the total number of live births might be higher

3 METHODS

The analyses and projections in this study focus on native Danish women born in 1960-1978 and resident in Denmark on 1st January 2004. We have reconstructed a complete history of their fertility, including ART-related fertility, for the period through 2003. All data on births and ART occurring in 2004 and later are projected. This implies that a considerable portion of fertility and most of ART use for women born since the late 1960s has been projected. For women born in 1974-78, most of their fertility and ART use is projected.

Projection scenarios of fertility were estimated for each parity category of women; we distinguished parities ranging from 0 to an open-ended category 5+. For women at each parity category, all the computations are based on the probabilities of having a(nother) child, specified for single age groups (ages 15 to 43 have been considered). The main set of assumptions affecting the outcome of our projection scenarios centers on different expectations about the further ‘delays’ in childbearing (i.e., about the continuation of the shift towards later timing of childbearing) and about further ‘recovery’ of the previously ‘delayed’ childbearing (i.e., the extent to which births that were supposedly ‘postponed’ at younger ages will take place at older reproductive ages, especially above age 30). Different possible trends in further fertility postponement and ‘recovery’ are captured by three scenarios which are further explained below. In addition, we formulate two scenarios of ART fertility, which are conditional on the three fertility scenarios (see below). Specifically, these two scenarios are based on the proportion of ART-fertility by age, analysed separately for first births and all birth orders. A more complex model could be built, where the scenarios of fertility and ART use are mutually independent and interact with each other. However, in the absence of surveys or specific data on trends in age- and parity-specific fertility intentions among women in Denmark as well as the data on the trends in infertility and the demand for ART use, we decided to abstain from making an independent scenario of ART trends, since any of our assumptions could not be sufficiently substantiated by the available data.

Projection scenarios of cohort fertility rates

Projection scenarios of cohort fertility rates combine the observed cohort fertility trajectory through 2003 and the projected age and order-specific fertility rates in 2004 and later. These projections constitute a mix of purely period-based (scenarios 1 and 2) and cohort-based computations (scenario 3).

S1: ‘No-change scenario’ assumes that after 2003 there was no further postponement of childbearing and no further ‘recovery’ of the previously delayed births. In effect, the age and parity-specific fertility rates remain ‘frozen’ at their 2002-2003 level (to avoid random fluctuations, the average for these two years has been computed).

S2: ‘Postponement stops scenario’ assumes that starting in 2004 there was no further decline in parity-specific fertility rates at lower ages. However, fertility rates at older ages are assumed to increase (‘recuperate’) since 2004 to the level implied by the tempo-adjusted age and parity-specific fertility rates, estimated using the adjustment procedure suggested by Kohler and Ortega (2002).⁴

S3: ‘Trend scenario’ assumes that the trend in cohort age and parity-specific fertility recorded during the last 6 years of observations (1998-2003) will continue since 2004 for another 10 years and, subsequently, age-parity fertility will remain constant. Linear extrapolation has been used to project changes in fertility rates in 2004-2013.

This third scenario is in our view the most realistic one, as the first and the second scenario reflect a fairly unlikely possibility that the shift towards later childbearing has come to an end after 2003. However, especially the first scenario provides a useful benchmark to evaluate cohort fertility trends in the event of no further childbearing postponement and no further ‘recuperation’ of delayed childbearing and compare them with the more dynamic scenarios S2 and S3.

Projection scenarios of ART-related fertility

Conditional on the fertility scenarios described above, we formulate two scenarios of ART fertility. These scenarios are based on trends in age-specific proportion of ART-originated first births and total births in 1998-2003.

ART-1: ‘No change scenario,’ in analogy to the fertility scenario S1, this scenario assumes that the age-specific proportion of ART births will not change any further after 2003 and will remain close to the level observed in 2000-2003. This longer period of observation of the ‘most recent data’ was used in order to reduce fluctuations in the age-specific proportions of ART births. In this scenario, any changes in ART fertility rates among cohorts having children in 2004 and later will be due to the changes in fertility rates at higher childbearing ages, when most of assisted reproduction takes place.

ART-2: ‘Trend scenario’ assumes that the age-specific proportion of ART births in 2004-2007 remains constant at the level observed in 2000-2003 and then changes since 2008 in line with the trend observed in 1998-2003. Differently from fertility scenario S3, we did not use linear extrapolation to project changing proportion of ART births at each age and for each calendar year. Because the ART use at some age categories fluctuates considerably, we preferred to make a simple one-time change extrapolation. This also prevents us from

⁴ Similarly to the other tempo adjustment methods, this method estimates hypothetical level of period fertility rates that would have been achieved in a given year in the absence of changes in the timing of childbearing (i.e., in the absence of ‘tempo distortions’). In addition, the Kohler-Ortega method also aims to estimate fertility level unaffected by the changes in the variance of fertility schedule. This adjustment method is rather complex; for formulas and further details please consult Kohler and Ortega 2002 and 2004. Our projections employ a simplified version of Kohler-Ortega’s method for estimating the adjusted fertility rates at birth orders 1, 2, and 3, whereas non-adjusted age-parity specific fertility rates are used for birth orders 4 and higher. The main simplification in estimating Kohler-Ortega’s adjustment involved not using an iterative procedure for estimating the annual increase in the standard deviation of fertility schedule by age, δ . Instead, we based the estimation of δ directly on Result 12 first described in Kohler and Philipov 2001 (10).

obtaining unrealistically high levels of ART births at younger ages, where the use of ART increased relatively fast in 1998-2003.

We consider this second ART scenario more realistic, as it is unlikely that the dynamic changes in the ART use will stop completely. However, it is possible that the demand for assisted reproduction becomes saturated in the near future and therefore we did not envision further strong increase in the ART use in our second scenario. Various assumptions of our projections are further discussed in the concluding section.

4 ANALYSIS AND PROJECTIONS OF FERTILITY OF NATIVE DANISH WOMEN BORN IN 1960-1978

4.1 Analysis of cohort fertility and ART fertility recorded until 2003

The analysis of cohort fertility of native Danish women born since 1960 shows trends that are similar to the trends for all Danish women, described in various publications (e.g., Frejka and Sardon 2004). Figure 1 shows the cumulative age-specific proportion of women having one and two children and the cumulative cohort fertility for women born between 1960 and 1980⁵. In correspondence with the hypothesis on fertility ‘postponement’ and ‘recuperation’, each subsequent cohort has fewer children at younger ages, but at a later age tends to ‘catch up’ with the preceding cohorts. The 1965 birth cohort even displays higher fertility of birth order 2 and higher overall fertility at age 38 than the 1960 cohort, but this effect is very small and less pronounced than for the total population. Thus, even when the influence of immigrant women with higher fertility rates on the overall cohort fertility trends in Denmark is disregarded, it is apparent that cohort fertility in Denmark did not decline among women born during the 1960s. This is in contrast with most other countries in Europe

⁵ Differently from the projection scenarios analysed below, where we show results only for women born until 1978 the youngest cohort analysed here is the 1980 cohort.

Figure 1: Cumulative first birth rates, second birth rates and total fertility by age. Native Danish women born in 1960-80

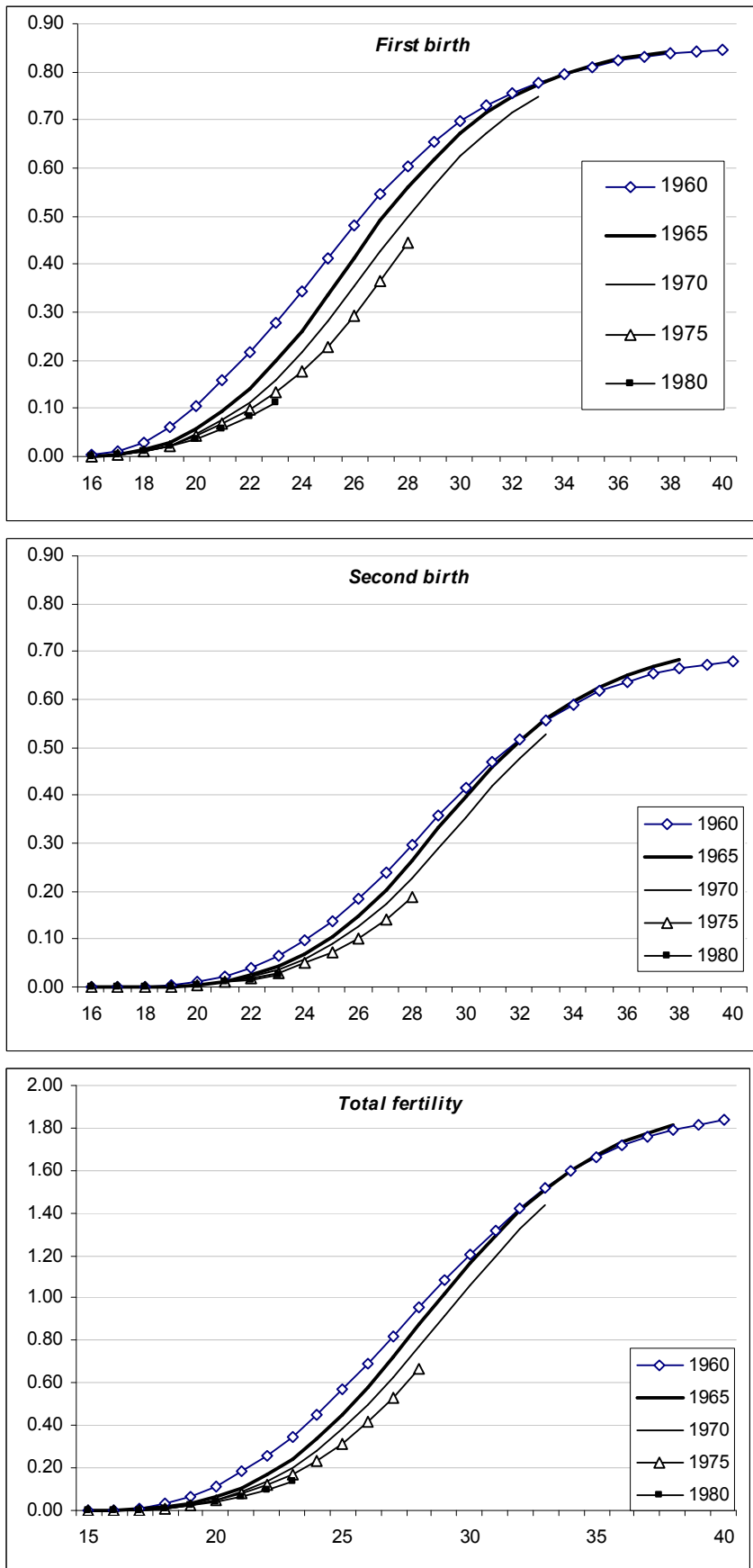
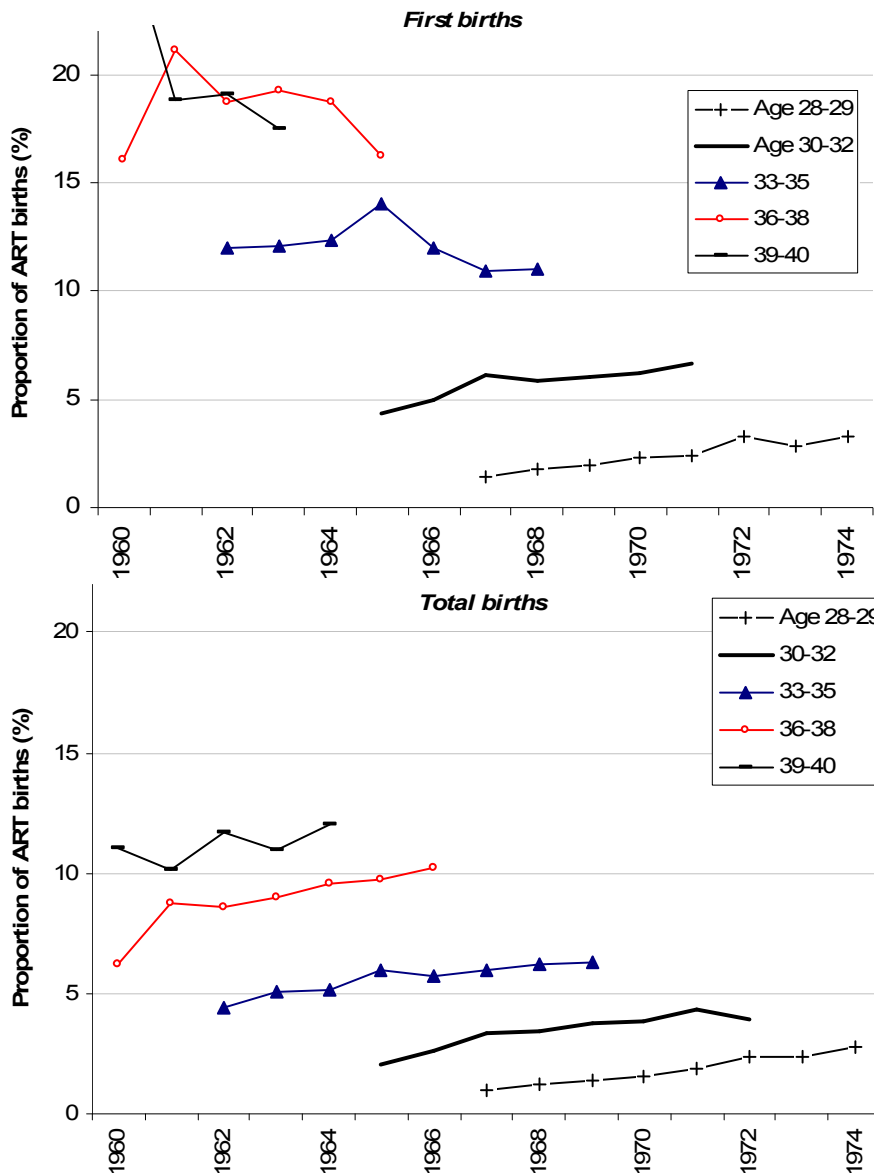


Figure 2 displays trends by age in the proportion of children born to women who had previously received ART treatment. Graphs for first and total births are displayed separately. Not surprisingly, the use of ART has been more common for first-born children, especially at higher ages. Very high proportion of ART-conceived first births at ages 36+ among women born in the early 1960s could be partly explained by the very low availability of assisted reproduction at their younger ages. This effect may also explain a downward trend in the proportion of ART-conceived first births after age 33 for women born after 1965. For these women, assisted reproduction became more available already at their late 20s and early 30s and an increasing number of them did indeed use ART at such ages. Most recent data show that ART treatment accounts for more than 10 percent of first births to women aged 33-35 and 15-20 percent first births to women aged 36-40.

Although ART births account for fewer total births than first births at any age studied, the importance of infertility treatment for total births increases over time. Over 10 percent of all births to women aged 36+ are born after an ART treatment. Moreover, the proportion of ART births is gradually increasing across all age categories, including women of younger reproductive ages, especially 28-32.

Figure 2: Proportion of children born after an ART treatment by mother's age; native Danish women born in 1960-78

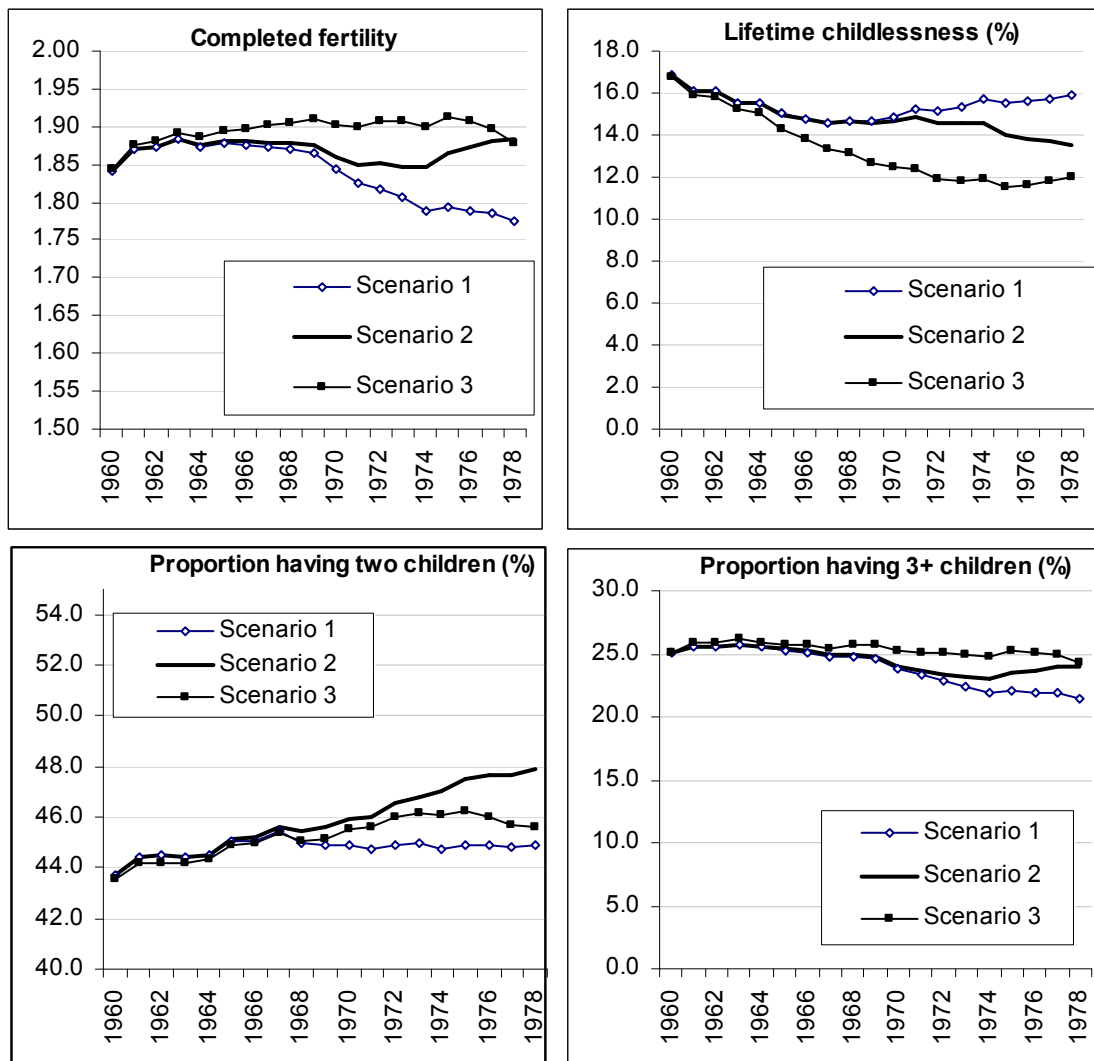


4.2 Projection scenarios of completed cohort fertility

Figure 3 features projected levels of completed fertility and parity distribution among women born until 1978. All the three projection scenarios show considerable stability of cohort fertility. The trend scenario (S3) results in a slight rise of the completed fertility to the level around 1.9 for women born after 1965 and a steady decline in permanent childlessness from 17 to around 12 percent. On the other hand, scenario S1, which keeps age-parity fertility rates constant after 2003, results in a declining completed fertility below the level of 1.8 for women born in the early 1970s and a U-shaped trend in final childlessness. As a result, women born in the second half of the 1970s are projected to have almost as high childlessness as those born in the early 1960s (close to 16 percent). Finally, scenario S2 (*'postponement stops'*) results in the levels of childlessness and completed fertility that lie between the results of the other two scenarios for women born after 1970. Completed fertility of women born in 1977-78 then increases to the level of the trend scenario S3.

The differences between these scenarios remain relatively small in the projected proportion of women born after 1975 with two children (45-48 percent) and with three or more children (22-25 percent). The trend scenario S3 implies further continuation of the ongoing shift towards later childbearing and results in a rise in the mean age at first childbirth from 26.3 year (1960 cohort) to 29 years (1978 cohort) and an increase in the proportion of births to mothers aged 35+ from 15 percent (1960 cohort) to 23 percent (1978 cohort).

Figure 3: Projected completed fertility, lifetime childlessness, and the proportion of women with 2 and 3+ children among native Danish women born in 1960-78



4.3 Projection scenarios of ART fertility rates

Most of our analysis of ART fertility focuses on the results of trend scenario of ART use (ART-2) in combination with the three fertility scenarios presented above. The ART-1 scenario provided results that indicate slightly lower ART fertility, but very similar trends as the ART-2 scenario. The projection shows a steady rise in fertility attributed to assisted reproduction. Overall, the increasing ART fertility can be explained by a combination of rising ART use at younger ages and rising fertility rates at higher reproductive ages when ART treatment becomes more common (Figure 4).

Figure 4: Cumulative ART fertility rates by age according to trend scenarios of fertility and ART; native Danish women born in 1965-78 (fertility scenario S3 combined with the ART-2 scenario)

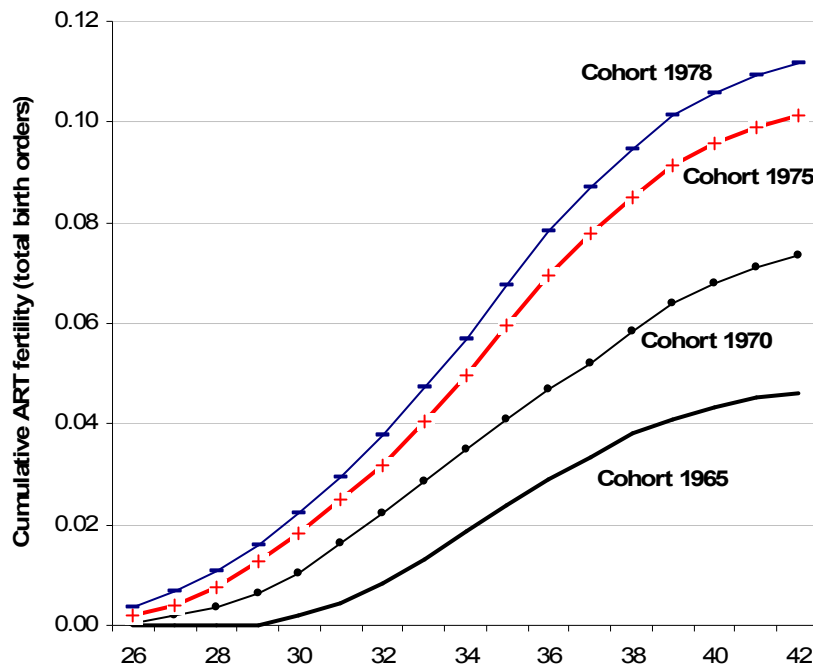


Figure 5 shows the projected ART fertility rates, non-ART fertility rates and the proportion of ART births by age in the 1978 cohort, based on the trend scenario of fertility (S3) and ART use (ART-2). While non-ART fertility is projected to peak at age 32, the ART-related fertility is expected to peak later, at age 36, and the relative share of ART births is expected to peak at yet higher age (39-42) at around 20 percent. To what extent will this projection hold depends on many factors, some of which are discussed in the concluding section.

This projection signals that the impact of assisted reproduction on fertility might become important especially for women who are currently in the midst of their reproductive span. The overall projected proportion of ART births according to different scenarios is plotted in Figure 6. A combination of the three fertility scenarios with the trend scenario of ART use (ART-2) yields a substantial increase in the proportion of ART births, from 2.5 percent among women born in 1965 to 5-6 percent among women born in 1978. An unlikely combination of the most conservative fertility and ART scenarios, which assume no further change in fertility rates and in the proportion of ART births after 2003 gives a projection of 4.4 percent ART births in the 1978 cohort (line representing scenarios S1 and ART-1 in Figure 6). Very similar trends and levels of ART births are projected for first births as well; a combination of the three fertility scenarios with a trend scenario ART-2 gives a very similar proportion of first births attributable to the ART for women born around the mid-1970s,

whereas in the older cohorts the frequency of first births due to ART was higher than the frequency of all ART births.

Figure 5: Projected age-specific ART and non-ART fertility rates and the proportion of ART births, native Danish women born in 1978 (fertility scenario S3 combined with the ART-2 scenario)

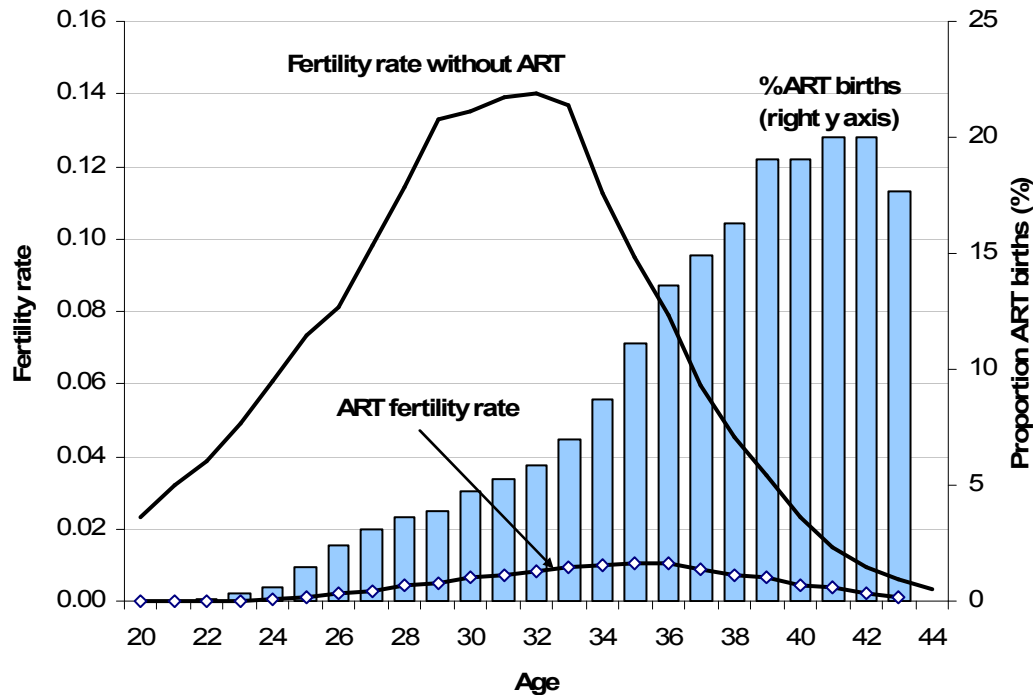
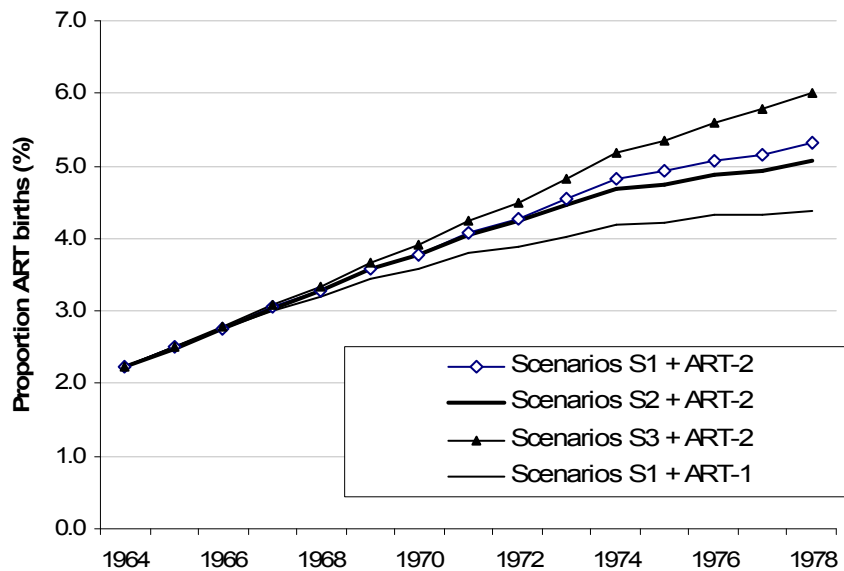


Figure 6: Projected percentage of children born after ART treatment to native Danish women, cohorts 1964-78



Finally, we scrutinise the envisioned impact of ART treatments on fertility rates. These results should be interpreted with caution, since some women who have children after an ART procedure would eventually conceive through sexual intercourse. The available data show that the likelihood of spontaneous pregnancy is not negligible, but the efficiency of infertility

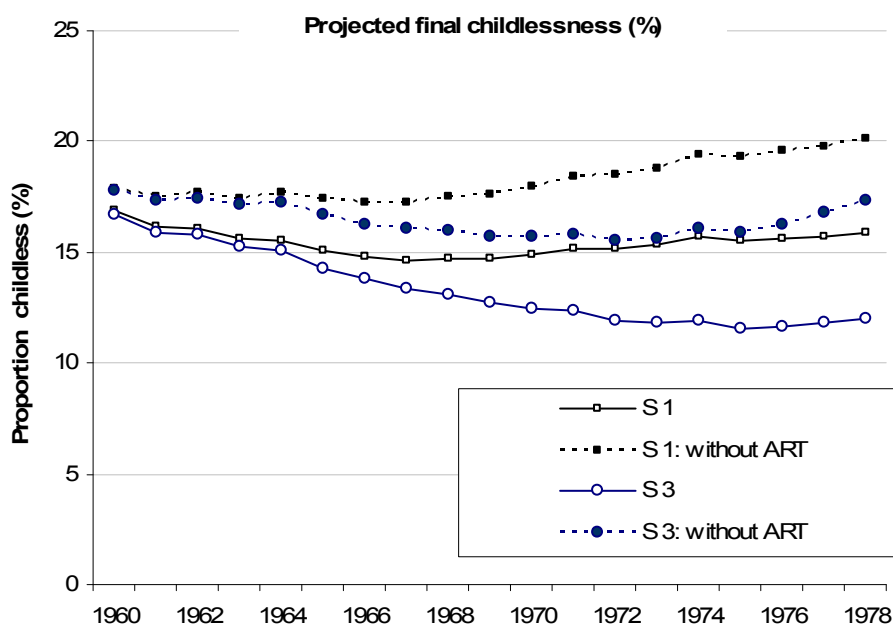
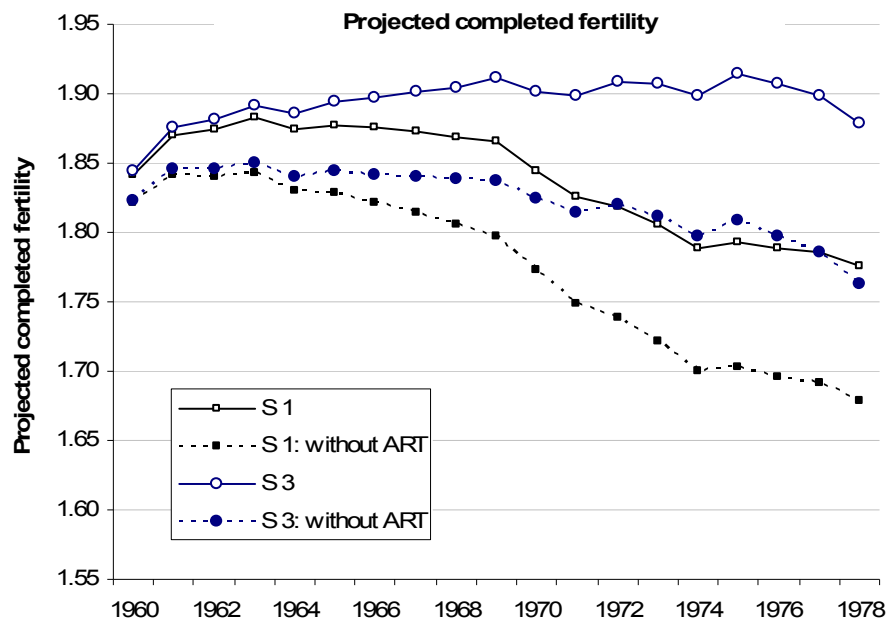
treatment in achieving pregnancy for the reportedly infertile couples is way above that level, perhaps with a notable exception of women above age 40 (Leridon 2004). Schmidt (2006: 405) cites different studies that show that 1.4 to 4.9 percent of Danish couples participating in infertility treatment in 1995-2004 in a large public clinic in Copenhagen achieved spontaneous pregnancy. Another study (Evers et al. 1998) shows that, depending on the infertility diagnosis, 12-months cumulative rate of spontaneous pregnancy was between 2.4 and 6.6 percent. Since many of these pregnancies end up by miscarriage, we estimate that the likelihood of spontaneous pregnancy leading to childbirth among the couples that are considered infertile is probably around one tenth of their likelihood of having a child after ART treatment – at least during the initial years of infertility treatment.⁶ We decided to ignore this effect in our computations presented below.

These methodological limitations notwithstanding, our study reveals that the impact of ART on fertility rates is likely to be substantial in the future. The estimated contribution of ART to sustaining higher fertility is most pronounced in the trend scenarios of fertility and ART use (S3 and ART-2): without ART, completed fertility would decline among women born in the 1970s and for the 1978 cohort it would reach 1.76 as compared to 1.88 with ART use. A combination of the constant 2003 fertility scenario (S1) with the ART-2 scenario yields a similar gap: 1.68 without ART vs. 1.78 with ART treatment (Figure 7). These results suggest that ART use in Denmark can make a difference in the overall fertility trends and may become one of the main factors sustaining relatively stable completed cohort fertility in the future.

The prevalence of childlessness also appears markedly affected by the spread of ART use. The S3 and ART-2 scenarios project lifetime childlessness of 17.4 percent among women born in 1978 reached in the absence of ART as contrasted with the childlessness of 12.0 percent when ART use is included.

⁶ Assuming that at least one half of the couples who do not succeed getting pregnant in their first ART cycle will go through another cycle within one-year period, the ‘success rate’ of ART treatment in the first year would approach 30 percent when measured by the proportion of couples achieving a pregnancy that leads to childbirth. This estimate is derived as follows: according to the 2002 data for Denmark, partly presented in Table 1, in each ART cycle based on IVF and ICSI more than 27 percent of women get pregnant and almost 21 experience childbirth. Assuming that one half of 73 percent of women who did not achieve pregnancy in their first ART cycle will soon initiate a new one, another 8 percent of women will eventually experienced childbirth in the second cycle. If we include the frequency of multiple deliveries in this analysis, there would be almost 29 pregnancies resulting in 35 live births per 100 women initiating an ART treatment in a given year. This compares with approximately 3-4 spontaneous pregnancies resulting in a live birth these women would experience in the absence of ART treatment.

Figure 7: Projected childlessness and completed cohort fertility among native Danish women born in 1960-78 (ART-2 Scenario)



5 CONCLUSIONS

This section is incomplete; final discussion will be drafted later

Our analysis shows that native Danish women born in the 1970s are likely to retain fertility rates that are relatively close to the replacement-level threshold and remain well above fertility among women in Southern and Central European countries, including Germany.

Younger women in Denmark will also probably experience further shift towards later childbearing, and most of their fertility will take place after age 30. The presented projections provide a strong support to our reasoning that the continuation of relatively high and stable fertility will be sustained by a rapid rise in the use of assisted reproduction. The projected proportion of children born after ART treatment shows a substantial increase from 2.5 percent among women born in 1965 to 5-6 percent among women born in 1978. Including intrauterine inseminations, this implies that among native Danish women up to 8 percent of children born to the cohorts of 1975 and younger will be born after an infertility treatment.

The spread of ART, which has become used more frequently also by women at younger reproductive ages, occurs due to the combination of several factors: continuing easy accessibility of ART treatments and public awareness about this option, rising infertility linked to the continued postponement of childbearing to higher reproductive ages, and more frequent use of ART among women who are already mothers and intend to have another child. In addition, the success rates of ART treatment may further improve in the future, especially at late childbearing ages. This would lead to a further increase in ART fertility rates. Some evidence on the rising infertility among Danish men could also partly explain the increasing ART use at younger ages (see Jensen et al. 2007). Our data do not enable us to make firmer conclusions on these factors.

It is important to reiterate that the presented projections are based on several assumptions. Because of many uncertainties regarding future trends in involuntary sterility among men and women and its impact on fertility rates and the demand for assisted reproduction we have based our projections on rather conservative estimates of ART trends. To what extent will the presented scenarios reflect reality depends on the following factors:

- whether ART success rates will improve for women in their late 30s and early 40s
- whether ART treatment will remain free of charge and easily available for women who do not have a child with their current partner
- whether the free provision of ART will be further expanded to second and higher-order births
- whether women with infertility problems will seek ART at an earlier age
- whether there will be an increase in infertility, especially linked to deteriorating semen quality among men
- whether ART use will become yet more common among women intending to have their second and third child

One additional factor, not envisioned in our analysis, will affect the number of ART births starting from 2007. Danish Board of Health has issued new regulations of ART treatments, banning the transfer of multiple embryos during ART for women below age 37. This regulation will result in a sharp decline in the deliveries of multiple births, which is likely to reduce the total number of ART births by up to 20 percent (probably less, since this reduction would occur if all ART-related multiple deliveries were eliminated and there would be no additional ART treatments eventually 'replacing' some of these 'prevented' births.

Our projections could be further refined in the future, especially if we obtain more detailed data on ART treatments. In addition, we plan to extend this analysis and investigate educational differentials in fertility timing and ART use in Denmark.

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(this part is incomplete)

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