

Research Note

An assessment of the size and cost of involuntary infertility that may be attributed to postponement by Gijs Beets

Abstract:

- The age at first birth has risen considerably over the past few decades, but some countries seem to approach the end of the postponement process.
- With substantial variation across Europe, later childbearing coincides with higher shares of childlessness. Most likely both voluntary and involuntary reasons play a role, and their shares are about equal.
- Educational expansion has had a considerable effect on later childbearing.
- A one year rise in the average age of the mother at first birth coincides with a 5 percentage point increase in overall childlessness in the same birth cohort.
- ART in its present form cannot make up for all births lost by the natural decline of fertility after age 35 years.
- Per year an estimated 525,000 to 750,000 ART cycles take place in Europe resulting in around 100,000 live births. Costs per cycle are around € 4,700. Total ART costs are estimated at €2.5 billion to €3.5 billion per year in Europe, i.e. about €25,000 to €35,000 per live born baby.
- Much more needs to be done to raise awareness among young women that their fertility drastically declines after the age of 35.

This Research Note has been produced for the European Commission by Gijs Beets (NIDI) on behalf the Demography network of the European Observatory on the Social Situation and Demography. The views expressed are those of the author and do not necessarily represent those of the European Commission.

An assessment of the size and cost of involuntary infertility that may be attributed to postponement¹

This Research Note is related to the one on Assisted Reproduction Technologies in Europe (Health Policy Network 2006) as well as on the assessment of the Tempo Effect on future Fertility in the European Union (Demography Network, 2006). Postponement of family formation leads to increases in the numbers of women (couples) confronted with fecundity problems which may lead them to apply for Assisted Reproductive Technology (ART) in order to fulfil their wish for children. What exactly is the relationship between having children and the age of the parents? Is late fertility a problem (see Annex 1)? How much infertility is there among couples who are trying to have children at advanced age, how often do they apply for ART, how often does this result in the birth of a child and what are the ART costs involved? These issues are dealt with in this Research Note.

1. | Fertility (number of children) and age

Over the past decades the age of the mother at first childbirth has increased significantly all over Europe. In 1960 women were on average around 24.5 years old in EU-15 and around 24.0 years in NMS-10 when they delivered their first baby; by 2003 these ages were estimated at 28.0 and 25.5 respectively. Countries above the EU-15 average are France, Germany, Ireland, Italy, Netherlands, Spain, Sweden and also Switzerland. In the three Baltic countries, Poland, Romania, and in the Slovak Republic the age is still below the NMS-10 average.

In general the increase in the age at first motherhood started in Northern and Western Europe (in the 1960s and 1970s), followed by Southern Europe (in the 1980s), while the rise in Eastern Europe is more recent (1990s). By decomposing fertility observations into tempo, quantum and mean generation size components Sobotka *et al.* (2005) show that fertility postponement has put a downward pressure on the number of births and so on the total (period) fertility rate (TFR, the mean number of children per woman). A possible stabilisation of the timing of first births may lead to some recovery of fertility rates and push the number of births upwards, depending on the number of women in childbearing ages. Rapid ending of fertility postponement may even lead to short-term baby booms. Sobotka *et al.* (2005) also argue that "past swings in the number of births imply that there is a considerable degree of instability in the future birth trends in most European countries. Although many ups and downs appear unavoidable, the changing size of tempo effects may become to some extent a surprise factor affecting future trends." We may be at the eve of such surprises given the fact that several countries are approaching the end of the postponement process (De Beer, 2006).

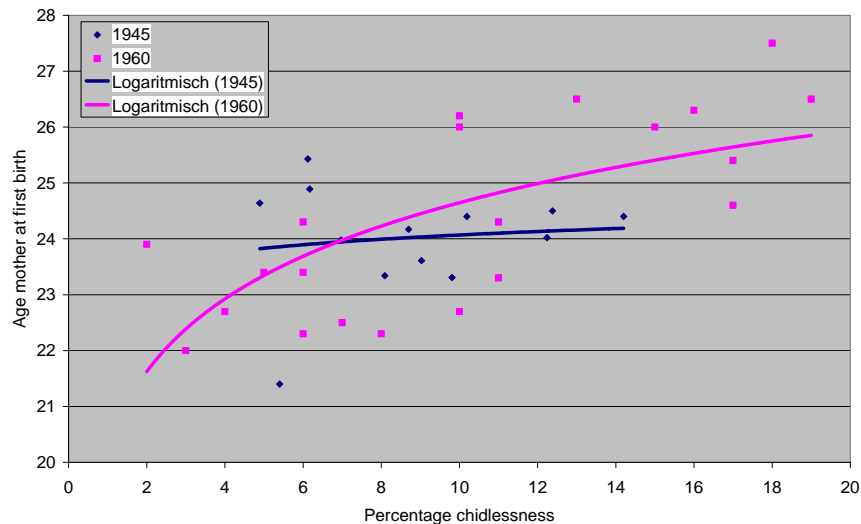
However, the increasing age of mothers at first birth coincides with increasing shares of women still childless at certain ages, and so with lifetime childlessness (see Appendix Table A2 with some data). On average currently half of the EU-15 women are still childless when they turn 28 years. (Projected) ultimate childlessness is still fairly low in the new Member States (around 13% for birth cohort 1965 which is also the level in the United States), more elevated in EU-15 (around 16%) and as high as 20% in Austria, England & Wales, Finland, Germany, Ireland, Italy, and just under 20% in the Netherlands (Dorbritz, 2005; Sobotka, 2004). In Graph 1 the correlation between the cohort percentages childless women and the cohort mean age at first birth are given (women's birth cohorts 1945 and 1960 where we can assume that childbearing has finished). In cohort 1960 a level of 10% childlessness is observed coinciding with a mean age at first birth of 24.6 years, while the 15%-level coincides with the age of 25.5. This implies that a 1-year increase in the age at first birth results in almost 5 percentage points extra childlessness. However this does not mean that this increase is involuntary only.

The group of people without children consists of two clear opposites: those who do not want to have children (voluntary childless) and those who unsuccessfully tried to have children (involuntary childless), some of them being traumatised (Van Balen *et al.*, 1995). In between are various other groups, for example those who are still doubting about having children, those who are still in an initial

¹ The views expressed are those of the author and do not necessarily represent those of the European Commission.

process of postponing, but also those who actually had wanted to have children but did not have them due to circumstances such as illness, the lack of a partner, or having a partner who already has children from an earlier union. Moreover the wish to have children may change over time. People may have doubts about having children in their twenties but not anymore in their thirties. Childlessness as wilful goal requires both an explicit choice and a permanent commitment to that choice (Miettinen & Paajanen, 2005). And such a commitment to a life without children may be regretted even much later in life when peers are having grandchildren. Research shows that childless people are at greater risks for social isolation in late life than parents as their networks become smaller more rapidly due to the fact that they have more network ties with age peers dying out (Dykstra, 2006).

Graph 1. Correlation between percentage childless women and age of women at first birth in two birth cohorts of women, European countries (source: Eurostat database)



Data on the size of each childless subgroup are not known with any precision; the topic is generally underresearched (Dorbritz, 2005). From medical sources it is known that only small shares of the population are clearly infertile. Norwegian data show that 2-4% of all couples are primary infertile (Noack, 1996). In addition infertility is unexplained for another small share of the population. However, the natural curve of 'sterile couples' increases with age: from about 4% for women who married around the age of 20, via 6% when marrying at 25, 10% at 30, 16% at 35 to 33% at the age of 40 years (Wood, 1994). Eijkemans (2004) finds similar results and concludes that the 'time-to-pregnancy' increases from age 30 onwards, but that women up to age 35 still have fairly good chances to start a pregnancy leading to a live born child, although it may take them longer to conceive. According to Eijkemans 10% of the 29 year old women is unable to have a pregnancy that leads to a live birth, which is 25% at age 37, 50% at age 40.5 and 75% at age 42.5. Natural fertility theory shows that the larger the number of children a woman has before she turns 30, the larger the chance that she can continue to have children beyond 30 years. This suggests that a substantial share of women from recent cohorts remaining childless throughout their life did not opt voluntarily for not having children. Toulemon (1995) estimated that about half of all childless couples in France are involuntary childless. This is rather consistent with the estimate by De Graaf & Loozen (2005) who show among self-reporting women aged 36 or over in the Netherlands a 55% share of voluntary and a 45% share of involuntary childlessness. Half of the involuntary childless women cannot have children anymore because of physical reasons. Since total childlessness is 19% in this group, this implies that about 4% among them is aware of physical problems, while about 10% is voluntary childless.

What are the reasons people have nowadays for much later childbearing than before? An important precondition for becoming a parent is to have a partner. Although it is possible to have children without a partner, hardly anyone does. As partner selection and union formation have fundamentally changed over the past decades (later union formation, more often non-marital cohabitation in stead of direct marriage, more union instability) more women than before are without a partner in their late-20s, early

30s. They may have had a partner before but obviously not all of these were considered to be a good partner to share parenthood with.²

Multivariate analyses usually do not come up with one single explanation for change. Billari (2005) even prefers to portray “families of explanations” for the changes occurring in partnership, childbearing and parenting. One of the more important reasons of later childbearing is education. Higher educated women have their first child several years later (currently in the Netherlands around 33 years) than lower educated women (currently around 26 years) (Kravdal, 1994; Gustafsson & Kalwij, 2006). Due to educational expansion the share of higher educated women has increased in the population. However the age at first birth has also risen among women of each separate educational level. In the Netherlands half of the increase in the age at first birth can be attributed to the rise in women’s education³. If it had not risen over the past three decades then the mother’s age at first birth would now have been around 26½ years in stead of over 29 years (and up from around 24 years around 1970 (Beets *et al.*, 2000). Similar findings were observed for other European countries but the real impact of education depends on the micro-macro level context, for example, work experience and welfare regime (Billari & Philipov, 2004; Miettinen & Paajanen, 2005).

Other reasons for later childbearing mentioned in survey research are: the wish to first have time to do nice things before having children, to make a start with the labour market career for at least a couple of years (and this reason is most explicit among the higher educated women; moreover unemployment at this moment in life does not lead to earlier childbearing but to further postponement), doubts about having children, the large responsibility involved when having children, financial constraints, different views of both partners on having children, the wished pregnancy did not start yet, and too little child care facilities available in the neighbourhood (see for example CBS, 2006). Often more than one reason is mentioned. Making a decision on the timing of children seems to have become more difficult than before. Although not specifically with respect to later childbearing, Hakim (2003) developed her preference theory on 1) women who are basically work-centred or careerist (give priority to jobs, often remain childless even if married, and endorse the competitive, achievement-oriented values of the marketplace), on 2) home-centred or family-centred women (prefer not to work after marriage and childbearing, often have many children, and espouse caring and sharing family values), and 3) adaptive women who seek a balance between employment and family work over the lifecycle as a whole; they tend to be torn between the two competing value systems of the marketplace and family life. Finding a balance in life may result in shifts between these groups and in delaying childbearing.

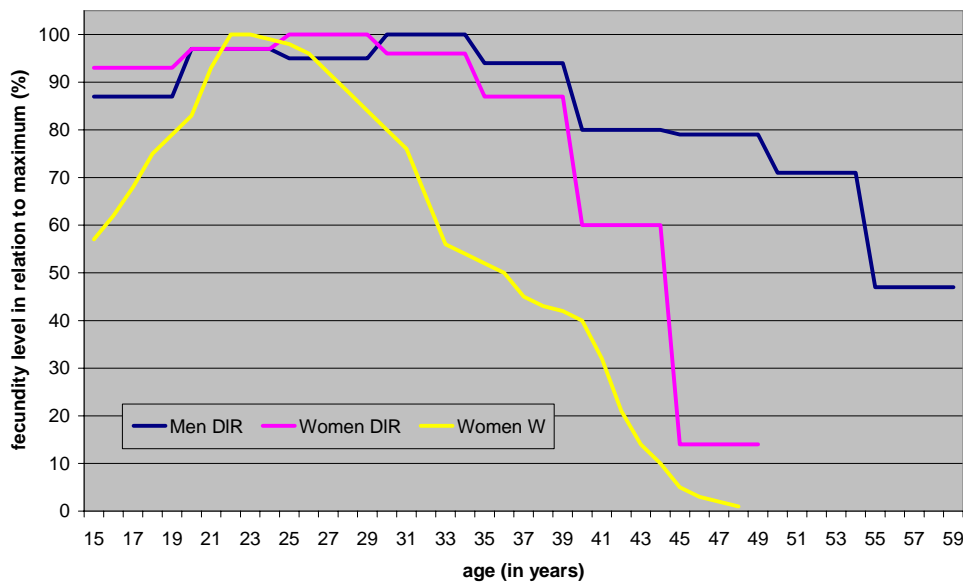
2. | *Fecundity and age*

People who want to have children and who are not successful may opt for fertility assistance. Medical doctors report on a lack of awareness among clients of decreasing fecundity with age and on overestimates of women’s fecundity (Brinkgreve & Te Velde, 2006; Lampic *et al.*, 2006). Also the possibilities of Assisted Reproductive Technology (ART) may be overestimated resulting in the belief that starting a pregnancy is as easy as preventing one. For some it comes as a shock when they become aware that their wish for children may not be fulfilled anymore. Graph 2 shows age-specific ‘natural’ conception probabilities compared to the optimal. The ‘women DIR’-curve (De la Rochebrochard, 2001) for example shows that in age group 40-44 it is almost half as likely for a woman to conceive (other conditions being equal) compared to women aged 25-29 years. At age 45-49 it is becoming very unlikely that a woman will easily conceive at all. However, not all researchers agree on the degree and speed of female fecundity decline by age. Wood (1994) gives age-specific fecundity rates that indicate much earlier decreases in women’s life after a top around age 22 (also given in Graph 2). Eijkemans (2004) gives a slightly different indicator which corresponds more with Woods than De la Rochebrochard. From the graph it is visible that male fecundity declines with age as well, although not as quick as for women.

² On 1 January 2005, 16.5% of all women aged 30 years in the Netherlands were living alone and that is up from 14.1% ten years earlier; and further: 50% of all women aged 30 years had at least one child in 2005, which is down from 55% in 1995. Conclusion: both living alone and childlessness are on the increase.

³ The rising education of men hardly had any effect on the changing age at first birth.

Graph 2. Variation in fecundity according to age, men and women (Source: DIR = De la Rochebrochard, 2001; W = Wood, 1994)



Te Velde & Pearson (2002) cite several authors who studied fecundability in natural populations (Leridon, 1977; Bongaarts, 1982; Spira, 1988; Wood, 1994). They argue that female fecundability declines with age in a manner that is universal throughout the human species. Although decreasing coital frequency plays a role as well, the female age-related contribution to this decline appears to be more important, especially after age 30. Te Velde & Pearson further state that this decline consists of two components: first, the monthly probability of conception decreases, and second, the probability that a pregnancy terminates early after conception or implantation increases (embryo loss, pregnancy loss, foetal loss, spontaneous abortion). They argue that the mean age of mothers at the birth of the last child found in natural fertility populations is rather consistent at 40 to 41 years. Therefore they regard this age as the mean age at which female fertility comes to an end and sterility starts, which means that the DIR-curve in Graph 2 could be too optimistic. The prevailing concept of human reproductive ageing assumes that the age-dependent loss of female fertility is dictated by the decline of both the quantity and quality of the oocyte/follicle pool. Already during foetal life the ovaries are endowed with the entire stock of follicles which has to serve a woman's reproductive needs for the rest of her life. Thereafter, numbers decline exponentially, with a marked increase in the rate of disappearance from age 37-38 onwards. From the millions present before birth, only about 300,000 oocytes are left at the beginning of puberty and thereafter hundreds vanish every month, also during pregnancy, breast feeding and use of oral contraceptives, when no ovulation occurs. This means that if women postpone childbearing, for whatever reason, biology and environment push in different directions (mismatch).

However, follicle depletion largely varies with age. Te Velde & Pearson suggest that this variation must be genetically induced by an as yet unknown number of genes, given the high heritability found for the age at menopause. Also in the age at menopause large variations exist (with a mean age of 50-51 years). Up to only a few years before menopause women hardly have any sign of the extent of their personal follicle depletion.

Te Velde (1991) suggests that normal fecundity gives a woman up to the age of 30, a monthly probability of about 20% to successfully conceive. After age 30 this probability diminishes: at age 35 it is 10% and at age 38 about 5% per month. This does not mean that half of all 35-year old women would be infertile, but it does imply that it will take them longer to conceive: a fundamental increase in the waiting-time-to-conception. If a woman has lower than normal fecundity then the monthly probability to conceive is reduced further. Table 1 gives an overview of the probability of having a successful pregnancy after 0, 5 or 8 years delay for couples with normal or below normal fecundity at the woman's age of 30 years (see also in Bouwens *et al.*, 1996). The table shows that 93% of the normally fecund women who start conceiving at age 30 will be pregnant within one year, and 100% within three years. However if these women would postpone another 5 years, i.e. they start at age 35 instead of age 30, the probability diminishes to 68 and 94% respectively. Conception rates within

three years are still substantially high even when delaying 8 years. The table shows lower rates for reduced fecund couples.

Leridon (2004) simulated reproduction combining the monthly probabilities of conceiving, the risk of miscarriage and the probability of becoming age-dependent permanently sterile. According to his model and under natural conditions, 75% of women who start to try to conceive at age 30 will have a conception ending in a live birth within 1 year, 66% at age 35 and 44% at age 40 (i.e. slightly lower than Te Velde's calculations). Within 4 years the success rates will be respectively 91, 84 and 64%. If women turn to ART after 4, 3 or 2 years respectively without conception, and if the rate of success is as observed after two cycles of insemination in IVF, ART makes up for only half of the births lost by postponing a first attempt of pregnancy from age 30 to 35 years, and less than 30% after postponing from 35 to 40 years. He concludes that also when some of the assumptions in his simulation model are less strict, ART in its present form cannot make up for all births lost by the natural decline of fertility after age 35 years.

Table 1. Effect of delay: percentages pregnant women after 1, 2 or 3 years trying to get pregnant (source: Te Velde cited in Bouwens *et al.*, 1996)

	Percentage pregnant women after:		
	1 year	2 years	3 years
Couples with a normal monthly chance to conceive (20%) at age 30 of the woman			
No delay	93	99	100
Delay of 5 years	68	87	94
Delay of 8 years	46	71	84
Couples with a below normal monthly chance to conceive (10%) at age 30 of the woman			
No delay	72	92	98
Delay of 5 years	46	64	75
Delay of 8 years	24	39	49

3. / Assessment of the frequency of ART and its costs

To assess the impact of ART and estimate the costs involved, the success rates of ART need to be taken into account. The data should be carefully treated as for example the rate of multiple births is relatively high in ART populations. Moreover it is debatable whether the results mainly stem from postponement, although this is likely since three quarters of the women who had ART cycles are over 30 years, and about half of them even over 35, which indicates that the share of couples that already experience childlessness after ART at relatively young ages is very small. Also after unsuccessful ART treatments it remains possible for couples to conceive naturally, but this will be rare.

Europe is the world leader in ART services, performing half of all reported treatment cycles worldwide (Research Note on ART by Health Policy Network, 2006 referring to Andersen *et al.*, 2006). In vitro fertilisation (IVF) and intra-cytoplasmic sperm injection (ICSI) are the most prevalent treatments ART has to offer. However there are many more treatments, like frozen embryo replacements, intra-uterine (donor) insemination or egg production stimulating medicines. Across countries there is considerable variation. As a result of a total of 324,000 ART cycles reported in 25 European countries in 2002 approximately 49,000 live births occurred (1 in 6). If we assume that the pregnancy rate per cycle is 1 in 3 (Research Note on ART gives 2002 rates between 26% and 30%) and know that ART births are estimated at an average of 1.7% of all births (12 European countries) then we may assume that today about 2% of all babies in EU-25 are born with ART, which would imply that in 2006 around 100,000 'ART children' were born. On average three ART cycles were needed to bring each of these children

to life, i.e. 300,000 cycles. In addition ART cycles were also provided to women who finally were not successful in having a live born baby. If it is assumed that these unsuccessful women were treated with *one* cycle on average, then in addition to the 300,000 cycles estimated for successful women (some 100,000 women with 100,000 live births after 3 cycles each) another 225,000 unsuccessful cycles were performed. Under these assumptions, the total number of ART cycles would amount to 525,000 cycles. If we would assume that unsuccessful women underwent *two* cycles on average, then the additional number of cycles would come to 450,000 cycles extra, amounting to a total of 750,000 cycles.

When the 300,000 yearly ART cycles leading to 100,000 live births in EU-25 plus the 225,000 to 450,000 unsuccessful cycles are taken together and the costs per cycle are estimated at €4,700 per cycle⁴, then the total current yearly costs in Europe of ART can be estimated at between €2.5 billion and €3.5 billion, i.e. about €25,000 and €35,000 per live born baby. Most likely the major share of these costs is postponement related.

Late fertility does not only give rise to (extra) ART costs. Also naturally conceived and born children (non-ART related) are coming at higher costs, as a consequence of the issues raised in Appendix A and the increased risks for mother and child mentioned in Table A1.

⁴ See page 11 in Research Note on ART where reports are quoted that mention cycle costs ranging within several European countries from £2,042 to £4,326. At current conversion rates these two amounts average to €4,706.

References

- Andersen, A.N., R. L. Gianaroli, J. Felberbaum, J. Mouzon, and K.G. Nygren (2006), Assisted Reproductive technology in Europe 2002. Results generated from European registers by ESHRE. *Human Reproduction*, doi:10.1093/humrep/del075.
- Beets, G. (1996), Does the increasing age at first birth lead to increases in involuntary childlessness? In: EAPS / IUSSP, European Population Conference Milan (1995), *Evolution or revolution in European population, Volume II*. Milan: FrancoAngeli, pp. 15-29
- Beets, G. (2004), De timing van het eerste kind: een overzicht. *Bevolking & Gezin* 33(1), pp. 115-142.
- Beets, G., E. Dourleijn, A. Liefbroer & K. Henkens (2000), *De timing van het eerste kind in Nederland en Europa*. Den Haag: Ministerie van Sociale zaken en Werkgelegenheid / Elsevier, 107 pp.
- Bongaarts, J. (1982), The proximate determinants of natural marital fertility. Center for Policy Studies. Working paper no. 89. New York: *Population Council*, 43 pp.
- Bouwens, A., G. Beets & J. Schippers (1996), *Societal causes and effects of delayed parenthood: preliminary evidence from the Netherlands*. Report written on behalf of the Commission of the European Union (SOC 95 100581 OSE01), 67 pp.
- Billari, F. (2005), Partnership, childbearing and parenting: trends of the 1990s. In: M. Macura, A. MacDonald & W. Haug (eds.), *The new demographic regime: population challenges and policy responses*. New York and Geneva: United Nations, Economic Commission for Europe, pp. 63-94.
- Billari, F. & D. Philipov (2004), Education and the transition to motherhood: a comparative analysis of Western Europe. *European demographic research papers, Vienna Institute of Demography*, 2004(3), 40 pp.
- Brinkgreve, C. & E. te Velde (2006), *Wie wil er nog moeder worden?* Amsterdam/Antwerpen: Uitgeverij Augustus, 270 pp.
- CBS (2006), Aantal oudere moeders neemt toe. Webmagazine 21 August 2006. <http://www.cbs.nl/nl-NL/menu/themas/dossiers/vrouwen-en-mannen/publicaties/artikelen/2006-2005-wm.htm>
- De Beer, J. (2006), An assessment of the tempo effect for future fertility in the European Union.
- De Graaf, A., & S. Loozen (2005), Door omstandigheden vaak geen of één kind. *Bevolkingstrends (CBS)*, 53 (2005)1, pp. 42-46.
- De la Rochebrochard, E. (2001), Sterility, fecundity: what about the men? *Population et Sociétés*, 371 (September 2001).
- De la Rochebrochard, E. (2003), Men medically assisted to reproduce: AID, IVF and ICSI in the medical treatment of male factor infertility. *Population (EN)*, 58 (4-5), pp. 487-521.
- Den Ouden, L., P. Verloove-Vanhorick & H. Bruinse (1997), Zwangerschappen op oudere leeftijd: gevolgen voor moeder en kind. In: Beets, G., A. Bouwens & J. Schippers, *Uitgesteld ouderschap*. Amsterdam: Thela Thesis publishers, pp. 41-47.
- Dorbritz, J. (2005), Kinderlosigkeit in Deutschland und Europa – Daten, Trends und Einstellungen. *Zeitschrift für Bevölkerungswissenschaft*, 30(4), pp. 359-407.
- Dykstra, P.A. (2006), Off the beaten track; childlessness and social integration in late life. *Research on Aging* 28 (6): 749-767
- Eijkemans, R. (2004), *Fertility in populations and in patients: population studies on natural fertility and prediction on treatment outcome in anovulatory infertile patients*. PhD thesis Erasmus University Rotterdam, 167 pp.
- Gustafsson, S. & A. Kalwij (eds.) (2006), *Education and postponement of maternity: economic analyses for industrialized countries*. European Studies of Population # 15. Dordrecht: Springer, 325 pp.
- Hakim, C. (2003), A new approach to explaining fertility patterns: preference theory. *Population and Development Review*, 29(3), pp. 349-374.
- Kravdal, Ø (1994), The importance of economic activity, economic potential and economic resources for the timing of first birth in Norway. *Population Studies*, 48, pp. 249-267.

- Lampic, C., A. Skoog Svanberg, P. Karlström, & T. Tydén (2006), Fertility awareness, intentions concerning childbearing, and attitudes towards parenthood among female and male academics. *Human Reproduction* 21(2), pp. 558-564.
- Leridon, H. (1977), *Human Fertility: the basic components*. University of Chicago Press.
- Leridon, H. (2004), Can assisted reproduction technology compensate for the natural decline in fertility with age. A model assessment. *Human Reproduction* 19(7), pp. 1548-1553.
- Miettinen, A. & P. Paajanen (2005), Yes, no, maybe: fertility intentions and reasons behind among childless Finnish men and women. *Yearbook of population research in Finland* 41(2005), pp. 165-184.
- Noack, T. (1996), How many people are involuntarily childless? *Yearbook of population research in Finland* 33(1996), pp. 60-71.
- Research Note by Health Policy Network (2006), Assisted reproduction technologies in Europe: an overview.
- Sobotka, T. (2004), *Postponement of childbearing and low fertility in Europe*. PhD Thesis Groningen University. Amsterdam: Dutch University Press, 298 pp.
- Sobotka, T., W. Lutz & D. Philipov (2005), "Missing births": decomposing the declining number of births in Europe into tempo, quantum and age structure effects. *European demographic research papers, Vienna Institute of Demography*, 2005(2), 62 pp.
- Spira, A. (1988), The decline of fecundity with age. *Maturitas Suppl.* ,1, pp. 15-22.
- Te Velde, E. (1991), Zwanger worden in de 21e eeuw: steeds later, steeds kunstmatiger. Oratie Utrecht University.
- Te Velde, E. & P. Pearson (2002), The variability of female reproductive aging. *Human Reproductive Update*, (8)2, pp. 141-154.
- Toulemon, L. (1995), Très peu de couples restent volontairement sans enfant. *Population* 50(4-5), pp. 1079-1109.
- Van Balen, F., E. Ketting & J. Verdurmen (1995), *Zorgen rond onvruchtbaarheid*. Voornaamste bevindingen van het Nationaal Onderzoek naar Gedrag bij Onvruchtbaarheid. Delft: Eburon, 53 pp.
- Wood, J. (1994), *Dynamics of human reproduction: biology, biometry, demography*. New York: Aldine de Gruyter, 653 pp.

Annex 1. Is late fertility a problem?⁵

It is mainly from the health point of view that late fertility is seen as a problem (see Table A1 with some health risk indicators): women, and that affect their partners as well, risk increased waiting times to conception, more demand for ART, increased risks of involuntary childlessness, of pregnancy complications (diabetes, hypertension), miscarriages, still births, multiple pregnancies, Caesarean deliveries, and later in life a higher risk of breast cancer. Consequently late fertility leads to more hospitalisations. Late born children have higher risks of immaturity and prematurity, perinatal and infant mortality, congenital defects. Part of these increased risks are related to the fact that late pregnancies more often are multiple. Late fertility leads to more children with physical and mental handicaps, which could give rise to selective abortion. These data suggest that late fertility implies higher health costs.

Demographic impacts of late fertility include increases in childlessness, more one-child families (i.e. more children without siblings). Lower fertility spurs population ageing (if the total fertility rate is below the replacement level) and leads to lower rates of and later grandparenthood. Serious health problems of children may be associated with parental divorce risks; also impacts on overall life expectancy are speculated upon.

The socio-economic impacts of late fertility are diverse and partly linked to population ageing costs. However late fertility also has positive sides: since more women are better educated and more committed to the labour market when still without children, it leads to more productivity and tax incomes, to more economically independent women, and to slightly lower costs for baby health care, child care and education, since the next generations are slightly smaller.

Other (dis)advantages are that compared to early childbearing (i.e. being a teenager or in the early twenties) late childbearing has the advantage that parents in general feel much better prepared for having children, both physically and emotionally. Older parents more often deliberately choose for having children, and in general have a better financial position. Children born to 'older' parents may complain about the fact that their parents are so old (almost like grandparents), have fewer physical capacities, and they may be concerned to become an orphan rather early. No evidence exists about possible negative impacts of late parenthood on child development and the upbringing of children. Finally it should be mentioned that involuntary childlessness usually is emotionally very straining and difficult to accept.

Since questions were raised on possible health risks of ART born children (in particular those conceived after ICSI) in several countries research has started to regularly follow-up on their health and well-being.

⁵

This section is mainly based on Beets (2004) and literature mentioned there.

Table A1. Selected health risks for mother and child by age of the mother at delivery (basic source: Den Ouden *et al.*, 1997)

	Mothers delivering at age 25-29	Mothers delivering at age 35-39
<i>Risks for mothers</i>		
To have a miscarriage	1 in 10	1 in 5
To have a multiple pregnancy	1 in 100	1 in 75
To have gestational complications (hypertension)	2%	6%
To have gestational complications (diabetes)	1%	4%
To deliver via a Caesarean, Netherlands	5%	9%
To deliver via a Caesarean, USA	6%	14%
To develop breast cancer by age 64	9%	12%
<i>Risks for children</i>		
To die, perinatal mortality	9λ	12λ
To die, infant mortality	6λ	7λ
To suffer from congenital defects	3λ	16λ

Table A2. Women by number of children (%), Total (Cohort) Fertility Rate and mean age of the mother at first birth per birth cohort (1945 and 1960), selected countries (Eurostat database)

	Childless		1		2		3+		TCFR		Mean cohort age of mother at 1 st birth	
	45	60	45	60	45	60	45	60	1945	1960	1945	1960
Belgium	9	17	31	28	35	34	26	20	1.93	1.86	24.2	25.4
Denmark	8	10	16	22	47	43	28	24	2.06	1.90	23.3	26.2
Spain	6	10	10	26	36	47	48	17	2.43	1.76	25.4	26.0
Ireland	6	16	12	10	17	28	66	46	3.27	2.41	24.9	26.3
Italy	10	15	19	25	41	43	30	17	2.06	1.68	24.4	26.0
Netherlands	12	18	13	16	49	42	25	25	1.99	1.85	24.5	27.5
Portugal	5	6	26	32	37	44	33	19	2.31	1.89	24.6	25.3
Finland	14	19	21	14	40	36	25	31	1.87	1.96	24.4	26.5
Sweden	12	13	17	15	45	41	27	31	1.96	2.04	24.0	26.5