

## **FERTILITY MYTHS, TECHNOLOGY MYTHS AND THEIR SOURCES – LAY REASONING ABOUT AGE-RELATED FERTILITY DECLINE**

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**ABSTRACT** *In many societies the average age for giving birth is rising. One factor which could contribute to the timing of childbirth – which has not been explored to a sufficient degree with qualitative research – is lay understanding of fertility and the possibilities offered by reproductive technology. Twelve focus groups were used to examine the reasoning of female university students in Hungary about age-related fertility decline, how they thought reproductive technologies could help, and how they drew on information sources. Although in many groups the existence of age-related fertility decline was acknowledged, fertility and technology myths – namely, overly positive misbeliefs – surfaced repeatedly. Building on some elements of the contextual model of Science and Technology Studies, I discuss how social-psychological phenomena such as resistance to the idea of personal risk can be important in lay interpretations of age-related fertility decline, as well as how exemplification processes can contribute to these myths.*

**KEYWORDS:** *fertility decline, reproductive technologies, lay reasoning*

## **INTRODUCTION**

In many societies a shift to later childbearing can be observed (Soini et al. 2006, Sobotka 2017). Delayed parenthood is especially a problem of developed societies (OECD 2016), and postponement of first births is a prominent

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characteristic of the fertility patterns of these societies (Sobotka 2004). Infertility specialists have argued based on research that delayed childbearing is related to higher rates of infertility and carries with it higher maternal and fetal risks. Besides the effects of age itself on fertility, the chance that women will suffer from illnesses or conditions that can cause infertility also increase with age (ACOG Committee on Gynecologic Practice – Practice Committee of ASRM 2014).

Moreover, although technological options can help to a degree with age-related fertility issues, technological help has its limits and cannot completely counterbalance the drop in fertility (Leridon 2004). In-vitro-fertilization (IVF) is expensive and success rates for the technique when using the woman's own eggs decline with age. According to US national data from 2014, whilst the chance of achieving a live birth in a single IVF cycle were around thirty-seven percent in women under thirty-five years old, this dropped to five percent in women aged forty-three, two percent for women aged forty-four, and were only one percent for women older than forty-four years (using fresh, non-donor eggs). In contrast, when eggs from young and healthy donors were used, the success rate with live births was very similar for the different recipient age groups. This shows the importance of the decline in the quality of eggs in age-related infertility and that the age of eggs affects the chance of becoming pregnant (CDC, ASRM – SART 2016). However, while IVF can enable pregnancy even past menopause with the help of donor eggs and for some this seems to be a miracle solution, many couples reject this option (Friese et al. 2006). Another form of technological help is social/elective egg freezing: when a woman's eggs are frozen for later use. The limitations of this procedure include its high cost, the fact that the practice is not allowed in some countries, and that for the highest probability of live birth, eggs must be frozen before the woman reaches the age of thirty-four (Baldwin et al. 2014, Mesen et al. 2015). Thus, this technique does not represent a miracle solution either, but only an option that can enhance the chance of becoming pregnant. It is also relevant that for women to use this procedure they should have knowledge of its benefits, understand that fertility declines with age, and acknowledge that this might also happen to them. Egg freezing with a reasonable survival rate is also a recent technological development, and the experimental label on the new technique of cryopreservation has only recently been removed by some medical bodies (ASRM – SART 2013), so that many women who are currently undertaking IVF have not had the opportunity to have their eggs banked.

Fertility postponement has the consequence that many couples will be faced with having fewer children than they intended, while some may even remain childless (Mills et al. 2011). On the individual level, research has demonstrated

that childlessness carries with it a swathe of negative psychological burdens (Hansen et al. 2009). Additionally, fertility postponement can contribute to lessening the total fertility rate in an era when in many European societies the latter has already fallen below replacement level (Miettinen – Szalma 2014).

Delayed parenthood is considered to be a result of fundamental social, economic and cultural transformation. A large number of factors have been identified as contributing to the shift towards delayed parenthood, such as higher educational attainment, greater female labor force participation and increased investment in career development, difficulties in reconciling work with motherhood, the uncertainties surrounding employment, widespread use of contraceptive devices such as the pill, greater emphasis on self-actualization, the growing demand for leisure, and changes in partnership patterns and social norms regarding parenthood (Sobotka 2004, Mills et al. 2011).

Szewczuk (2012) emphasizes that from a sociological perspective fertility postponement can be looked upon as a social practice. On the macro level this social practice influences demographic structures, whilst on the micro level it “it shapes and structures female bodies and experience” (Szewczuk 2012: 429). Reproductive norms have changed to such a degree compared to earlier times that in the early part of the female adult life course childlessness can be regarded as a normative stage for many segments of the population, whilst in the later stages fertility is the reproductive norm. This childless stage during the life course of women enables them to have a career and access other opportunities, whilst at the same time contributing to fertility risks because of the age-related fertility decline. Szewczuk argues that on the micro level modern contraceptive methods mean that many women have the illusory notion of reproductive control. Contraceptive pills signal to women that technology can be trusted and can help them with their reproductive goals, and that reproduction can be clearly planned and birthing put off, giving a feeling of reproductive control, whilst at the same time being so user-friendly that women do not have to think about these choices too much. This can result in fertility issues being “put on the back burner” (Szewczuk 2012: 429); i.e. not being thought about nor talked about during the time of postponement, but then contributing to age-related challenges with childbirth.

In recent years a number of studies have drawn attention to the understanding of biology and reproductive technology as factors which also might influence the timing of childbirth. There are some indications that a knowledge deficit could potentially play a part in decisions about timing, although as a new research topic these issues have mainly been investigated retrospectively, or involved the examination of plans for the timing of childbirth, not actual registered births (Mac Dougall et al. 2013, Stern et al. 2013, Wojcieszek – Thompson 2013).

These results suggest that, for some women, having a better understanding of related issues might change their life strategies, thus making the study of these beliefs a relevant goal. However, so far these beliefs have been studied mainly using questionnaires while only a few qualitative research projects have taken understanding of age-related fertility decline as their central focus of investigation, which is the goal of the current study. Research is especially scarce about how people draw on different information sources in their reasoning. With the trend of fertility postponement likely to continue (Soini et al. 2006), there is a critical need to study these issues in more depth.

The questions that guided the research this paper is based on were as follows:

1. How do Hungarian female university students make sense of the relationship between age and fertility in group discussions?
2. How do they see the role of technology in terms of being able to help with age-related fertility problems?
3. What information sources are the respondents drawing upon, and how, when making sense of age, fertility decline, and reproductive technologies?
4. Do the social-psychological factors associated with the contextual model of science/health communication appear in their reasoning, and if yes, how?

Although some research has touched upon how age-related fertility is regarded by members of the lay public, there is still a striking lack of sufficient and intensive exploration of this topic. A range of quantitative research projects have been conducted in recent years which included some questions related to these issues (Bretherick et al. 2010, Bunting et al. 2013, Conceição et al. 2017, Daniluk – Koert 2015, Daniluk et al. 2012, Hashiloni-Dolev et al. 2011, Hewlett 2002, Gossett et al. 2013, Lampic et al. 2006, Maheshwari et al. 2008, Maeda et al. 2016, Peterson et al. 2012). However, there are limitations on the evidence base of these studies. Most involved small samples and, even in case of bigger samples, many were non-representative. Moreover, some of the research focused more on fertility awareness in general than age-related issues.

More importantly, there is a dearth of international qualitative research which has investigated the topic of this article comprehensively and in-depth as its main focus. Accordingly, there is a need for more qualitative research that yields in-depth information about the sense-making process itself, and about how research subjects build their arguments, rather than simply offering a static view (Kotchetkova et al. 2008). Previous qualitative studies that have touched upon some of the issues involved in the current research mainly either investigated broader themes of which the present focus was just one of the sub-topics (e.g. Cooke et al. 2012, Hewlett 2002, Jarrett – Lethbridge 1994), or concentrated on special populations of women who discussed these issues retrospectively

after having become pregnant with the assistance of reproductive technologies (e.g. women who became pregnant with the help of IVF after the age of 40 [Mac Dougall et al. 2013], or couples who had conceived with the help of donor oocytes – [Friese et al. 2006]) or women who had previously used contraceptive pills who had turned to IVF unsuccessfully after the age of 35 (Szuwczek 2012).

Almost all previous research took place in leading high-resource countries, so less is known about the situation in other regions. Previous research in Hungary with childless women gave some indication that there might be knowledge problems with fertility issues (Szalma-Takács 2014, Szalma-Takács 2015), and the results of a representative survey show that attitudes toward artificial insemination are positive (Szalma 2014) – however, no previous sociological research has been conducted in Hungary that focused on the topic of age-related infertility.

However, in spite of the differences in method, focus, sample and society where these earlier research projects were conducted, some similar conclusions can be deduced from them in connection with the current topic. Such studies suggest that there can be knowledge gaps and misperceptions amongst women or members of the public in general with respect to age-related fertility issues – typically involving overestimations of the probability of getting pregnant at certain ages. Studies have also found that success rates of IVF, and IVF for specific age groups, are repeatedly overestimated.

In the present article I use the term “*fertility myths*” to refer to these overly positive assessments of fertility-related challenges and to the arguments and beliefs linked to them. Fertility myths are connected to falsely positive evaluations that overestimate the probability of successful pregnancy for certain age groups and to evaluations that downplay the role of age in fertility. In this paper I use the term *technology myth* to denote such overly positive evaluations of potential technological success (mainly IVF with own eggs) regarding cases of failure to conceive naturally, and more concretely, with age-related infertility. As I have argued, the above-mentioned international research has often identified the existence of such fertility and technology myths (as defined above) amongst research subjects.

There are also some indications from the former empirical research base that a greater knowledge deficit among young people such as university students may exist compared to the somewhat older demographic group that still has the possibility of childbearing (Maeda et al. 2016). Bretheric and co-authors (2010) found that although members of their Canadian student sample were mostly aware that fertility decreased with age, they significantly overestimated the probability of successful pregnancy in each age group, and were not aware of how sharply fertility decreases with age. In the case of 169 British university

students, a lack of knowledge and misconceptions were mainly related to ideas about increasing fertility (for example, through healthy lifestyles) (Bunting et al. 2013). Hashaloni-Dolev and his co-authors (2011) came to the conclusion based on an Israeli student sample that students particularly overestimated the chance of genetic maternity for women of over 35 and also 45 years old. Only 11 percent of the student sample knew that genetic motherhood is unlikely to occur after a woman reaches her mid-forties, unless she has had her eggs frozen previously.

## THE HUNGARIAN CONTEXT

Similarly to other Central and Eastern European (CEE) countries, Hungary is characterized by a low level of total fertility (Basten et al. 2013). The low number of births can be attributed to several factors, of which infertility problems among the population is only one (Kapitány 2012). Delays in parenthood can contribute the fertility decline of societies. Similarly to some CEE countries, especially the Czech Republic, Estonia, the eastern part of Germany and Slovenia, in Hungary a very rapid shift towards later motherhood occurred at the end of the twentieth century and the beginning of the twenty-first (Basten et al. 2013). The tempo of fertility postponement has slowed somewhat in the past few years (Kapitány – Spéder 2015). The proportion of women who have their first child at above the age of 35 or 40 was much higher in 2011 than two decades earlier (Kamarás – 2012). Around a third of women born in 1980 had not had a child by the age of 35 (KSH, 2016). As voluntary childlessness is extremely rare in Hungary (Miettinen – Szalma 2014), this suggests that the data cannot be explained by a desire to remain childless, and that some women might have a hard time fulfilling their parenthood plans, especially as in the great majority of cases Hungarians still want two or more children (Spéder 2014).

Another relevant factor is that the average age of first-time mothers is connected to educational attainment (KSH, 2016). This puts women who have completed higher education at greater risk of age-related infertility problems and failing to fulfill their motherhood plans and makes questioning university students especially relevant. Previous studies have found that childlessness is more likely to occur among those with tertiary degree (Szalma – Takács 2012).

Legal regulations permit IVF in Hungary, both with non-donor and donor eggs, although in the latter case who can be a donor is very strictly regulated. Surrogacy is not allowed, and at the time of writing this article elective egg freezing was not permitted, although a debate had started about its possible inclusion among the other fertility treatments that are available (Sándor et al.

2017). It is currently estimated that approximately 1.5–2.5 percent of all children born in Hungary were conceived with the help of IVF technology (HCOG 2012). State funding is available for five IVF cycles if certain criteria are met, although patients still incur some costs, especially if they want to make use of better quality medicine, which creates difficulties for some patients (Bauer 2014a, 2014b). Economic and demographic factors as well as cultural norms have been shown to be correlated to the extent assisted reproductive technologies are used within European societies (Präg – Mills 2017a). In comparison to other European countries, use of these technologies is quite low in Hungary (Präg – Mills 2017b).

## LAY UNDERSTANDING OF SCIENCE/HEALTH ISSUES

Several models deal with lay theorizing in connection with health and science topics and the differences between lay views and expert opinions. This study draws on what have been termed by Lewenstein (2003: 3) the “contextual approaches” of science and technology studies involving science communication, which claim that “individuals do not simply respond as empty containers to information, but rather process information according to social and psychological schemas that have been shaped by their previous experiences, cultural context, and personal circumstances.” Research has demonstrated that there are many contextual factors which can influence how information about health topics are received, including social psychological phenomena, the characteristics of the individual, the health literacy of the audience segment, society, and other cultural factors (Gallagher – Updegraff 2012, Hastall et al. 2013, Sorensen et al. 2007, Kreps – Thornton 1992, Kreuter – McClure 2004, Takács 2016, Hinnant – Len-Ríos 2009). From all these factors, the current study focuses on social-psychological factors. It has been repeatedly argued that, as health communication involves information which can be personally troubling (for example, information about the potentially negative risks that a person may face), psychological phenomena can include avoidance and denial in processing this information (Gallagher – Updegraff, 2012), as well as fear (Maeda et al. 2016). Instead of relying on one theory, this study takes a broader explorative approach to see whether and how social-psychological processes play a role in lay interpretation.

In the study I apply a media effects perspective which assumes that audience members actively construct their views. Building on the effects-in-use approach of Gamson (1992), I treat media content as one conversational tool that people

can use in their discussions. This media-effects lens permits the study of this phenomenon and investigation of how media content is used as a conversational tool in practice – for example, how information or arguments that surface in the media appear in conversations. Use of this tool is treated as a media effect. Besides media, other conversational resources may also be employed, such as personal experience, or talking with other people, etc.

## METHODS

Twelve focus groups were held in the course of the research between October 2015 and April 2016. The sample consisted of 71 female university students aged between 19 and 25, studying at diverse universities in Budapest, the capital of Hungary. Some students were majoring in humanities, and others in social sciences or natural sciences. Focus groups were heterogeneous internally with respect to the majors and to the universities the students were studying at. One criterion for selection was that students could not be majoring in biology or medical science as in this case they might have greater knowledge pertaining to the research subjects than others. MA/MSc students took part in four of the groups, in five groups only BA/BSc students participated, and in three groups participants were mixed in terms of type of degree. An incentive in the form of a small payment was provided to encourage participation.

The research design was approved by the relevant research ethics committee on 4 March, 2014. Research subjects gave their informed consent to taking part in the study.

The guide consisted of three main parts. In the first half of the first section, participants were asked about how they see the relationship between age and fertility. Then questions were asked in connection with how respondents assess the role of reproductive technologies in helping with age-related fertility problems. In the second part, participants were asked their opinions about the different reproductive technologies and whether they would think about utilizing these technologies themselves. In this part, questions were initially asked based on participants current knowledge, and then they were given some information about the technologies. Finally, in the third part group members were questioned about their information sources regarding the topic. In the current analysis I draw mainly on answers given to the first and third parts of the guide. Focus groups lasted approximately 80 minutes on average.

The focus group discussions were transcribed and transcripts were imported to the qualitative data analysis software NVivo and analyzed using qualitative

thematic analysis mainly following the criteria of Braun – Clarke (2006). The dynamic nature of the lay reasoning in the focus groups and the sense-making of the issues as a process was also under scrutiny in the analysis. Names in quotes are not translations of the speakers' Hungarian names but have been changed in order to protect anonymity. Some of the quotes consist of a single contribution from a group, while others are chunks of conversations, as shown by quotation marks.

In interpreting the focus group results, it is relevant to remember that because of the group situation certain social-psychological phenomena can influence outcomes. For example, there may be pressure not to deviate from group norms (Stewart et al. 2007). Participants were encouraged to voice their answers even if they felt unsure or if their answer was that they did not know. Still, it may be the case that those who were more uncertain of their answers allowed those who seemed to be more knowledgeable about the topic to dominate, or were influenced by them (Vicsek 2007).

## RESULTS

### *Lay reasoning about age-related fertility decline*

Asked about the relationship between age and fertility, in some groups the discussion started with the acknowledgement that there is a relationship.

“Emma: I think yes, they're connected. The later you have a child, the harder it is to get pregnant and the less healthy the child will be. And the more difficult the birth will be.”

In other groups, the sense-making process involved group members instantly starting to talk about other factors that, according to them, influenced infertility – a strategy that seemed to rhetorically lessen the emphasis on age. It was often openly argued that these other factors – stress, mental and psychological health, lifestyle, physical fitness, earlier experience with abortion, genetic variables and illnesses, etc. – count much more than age. Besides genetic variables, other factors mentioned in connection with fertility were mainly things that these young women felt that they themselves could control, or that did not characterize them (for example, they defined themselves as healthy in contrast to ill people who typically had infertility problems). The argument recurrently arose that if a person were psychologically well and fit, did sports, and ate healthy foods then the fertility decline would be less, or might even be entirely avoidable.

“Kate: If you’re healthy, exercise, keep your body young, in my opinion you have a chance of eliminating these age-related things.”

“Jane: It’s more to do with genetics than age: it’s harder for some women to get pregnant and easier for others, that’s why some succeed right away at 40, while others enter test-tube baby programs, because it also depends on the state of health, whether they had a more serious illness, an inflammation of the ovaries, things like that, so it doesn’t necessarily depend on age, there are a lot of other things too.”

For a few people, the role of psychological factors was believed to be so prominent that they claimed not to believe in the existence of biological reasons for infertility. Although in some cases arguments were made about the interaction of psychological factors and age (i.e. the idea that in older age one may be too stressed to have a baby, and that one may accumulate more stress during years at a workplace), at other times psychological factors were discussed irrespective of age, again diminishing the importance of the latter.

Many focus group participants mentioned later in the discussions that there was some relationship between age and fertility. However, in some cases when this relationship was acknowledged there was a preference for emphasizing how very context-dependent this relationship was; that it was not a strong relationship, that some people could easily get pregnant even in advanced age, or even that this rule did not apply to everyone. There were also some instances when the stronger endorsement of a fertility myth occurred: participants argued that age was not necessarily a factor that made getting pregnant more difficult.

“Clara: I think it is related at some level too, that older women are said to be not so fertile, but we know of cases of women becoming mothers at forty or fifty. So it depends on the individual too.”

“Jessica: I think so too, obviously age has something to do with it, the chances are lower, but as others have already said, that doesn’t apply to everyone, it depends on the individual, for instance on their state of mind.”

The age 35 surfaced repeatedly in the groups. When asked about the start of the fertility decline, this age was most frequently mentioned. However, the age of 35 was mainly associated with an increased risk of health problems for the fetus and the baby. Even if the question pertained to age and the difficulty of getting pregnant, answers often focused on illnesses which are typically an issue *after* a woman becomes pregnant. In some of the groups it was argued that the idea of an increase in difficulties at age 35 is just a stereotype or refers to a statistic, or applied in earlier times but is now no longer relevant as medical technology has progressed, or that mention of this number is just scare-mongering – but what really mattered was individual-level factors, or that with a positive outlook women could influence this factor.

Different views were voiced in answer to a question about the ease of getting pregnant when 40-45 years old. Some research subjects emphasized the difficulty of getting pregnant after 40, whilst in other answers a fertility myth regarding this age group arose: the claim was that it is not so much more difficult to become pregnant at this age than at a young age. It was again argued that fertility success was a very personal issue. Some of these statements were supported with examples of acquaintances or media stories about women who had become pregnant when over 40 years of age (more on this later). Some participants noted the trend for more pregnancies for women in their forties, with motherhood being delayed, and this trend was seen to support the possibility of fertility at that age.

“Moderator: In your opinion, how easy is it to get pregnant at forty or forty-five?”

Clara: I think it’s not as easy as earlier... But it can still happen.

Jennifer: That depends too. Because it’s more difficult on average, but some women can very, very easily get pregnant at any time really.”

“Moderator: And if someone wants to get pregnant at the age of 40–45, how easy or difficult do you think it is?”

Ann: It depends on the genetic makeup. I don’t think you can tell in advance.”

The chance of motherhood after age 45, and even cases of women bearing children at the age of 60 and 65 years old were mentioned, not as a high probability, but the possibility was thought to exist – although in a few cases there was some confusion over how a woman could be pregnant at such an age. These discussions took place before the moderator brought in the topic of technology, but it was notable that the involvement of technology was often not mentioned by participants.

“Eve: There are always cases like that. Last year a 65-year-old woman got pregnant.”

A fertility myth about advanced maternal age was in a few cases supported by a resistant attitude. Some participants talked about having feelings of resistance as reaction to the pressure they felt from society, the government, family members and relatives regarding women and the timing of childbirth and the number of children they should have. This pressure was thought to have a social origin. It was perceived that the incumbent conservative government views the primary role of women as mothers, or wants women to have multiple children to halt the decline in the population of Hungary. Group members expressed the view that parents and older relatives were exerting pressure as they had not yet accepted that motherhood was being delayed by many women. When arguments were formulated around the notion that women are pressured to have children, the biological cause of age-related fertility issues was left out of the picture. Many

participants felt that the message of the government was overly conservative with respect to women and rejected it. Because of this, some claimed to be skeptical and did not believe information about age-related fertility difficulties:

“Megan: But what I don’t like about this is that there seems to be strong social pressure on you to have a child now, which starts long before there would be any biological difficulty. I have a feeling about the 40-year age limit, it’s not at all certain that it becomes difficult from the age of 40, it’s just society thinking that here is a person who still doesn’t have a child when she really should.”

The mechanisms underlying the decline in fertility were not known by many, or such knowledge was not easily accessed. When the moderator asked what participants thought explained the decline in fertility with age, some participants remained quiet, said they didn’t know, or did not give an answer. Others gave answers involving the condition of the uterus, the aging of the female body leading to less regeneration, more stress in older age, and the accumulation of lifestyle impacts. In a few cases changes in levels of hormones were mentioned.

Only in half of the groups was the decline in the number of eggs mentioned, and then often not emphatically and commonly very uncertainly, whilst the fact that the quality of eggs declines hardly arose in group discussions at all.

“Dora: Yes, I’ve heard about something like that, I don’t know exactly, that after a certain age there are fewer eggs or something, I’m not good at biology.”

### ***Lay reasoning and the role of technology***

IVF with or without sperm donation, medical/hormone treatment, and surrogacy were mentioned most often as reproductive technologies in the groups. Insemination, elective egg freezing and IVF with donor eggs were less well known, with most participants not having heard about them or not knowing what they entailed. Egg freezing was somewhat more familiar to some of the respondents than IVF with donor eggs or insemination. However, even to the former it was often not completely clear for whom elective egg freezing was intended, and how it works. In none of the groups was it mentioned that one way to help older women with infertility issues would be to have IVF using the donor eggs of a young woman. It is notable that while IVF with donor eggs is allowed in Hungary, the process was basically unknown by participants – whilst the issue of surrogacy, which is not legal, arose many times in the discussions. During the process of trying to make sense of what IVF using donor eggs might involve (in response to the moderator’s questions about it), it was often confused with surrogacy.

Technology myths were abundant, along with optimism regarding the ability of technology to help with infertility problems in general, and more concretely, with age-related fertility decline. Even before the topic of technology entered the discussion (through the moderator), the potential assistance of technology was brought up spontaneously in some groups as a means of achieving pregnancy in advanced maternal age. The current use of IVF (without egg freezing in younger age) was seen as helping in this regard.

During questioning about technology, most of the female university students emphasized how technology and medical science are constantly developing and offering help with motherhood in advanced age:

“Rebecca: “I think there must be a difference in success with the test-tube baby procedure with age, but perhaps the difference isn’t so big, I don’t know, but obviously it is more difficult for an older women to get pregnant, say over 40, and easier for someone aged 20. But in my opinion, if IVF is used and they try, I think the difference is much less [compared to the case when no technology is used].”

“Moderator: Do you think that the development of medical methods can help with solving the infertility problems that arise with age?”

Angie: I think they can help a lot now. At 25 I’m not at all clear about things, I only know that this possibility exists and it can be quite useful if you are in need of it.”

Some university students even argued that these technologies make pregnancy currently possible for age groups that would not be able to conceive naturally.

“Susan: I think it’s very hard (to get pregnant at such a late age). I can’t imagine how it’s possible the natural way. I think it can only be done with IVF and close monitoring of the pregnancy.

“Moderator: What do you think influences the success of the IVF procedure? Can it be influenced by age?”

Ellen: Not so much in my opinion, I have a feeling that if someone doesn’t succeed in getting pregnant because of age or for any other reason, it acts as a substitute for that phase. I have a feeling that it eliminates these possibilities.”

Group participants were also asked what they thought the age limits for successful IVF treatments with their own eggs were. There were differences in the groups with respect to their answers, but a significant number of participants again succumbed to the technological myth that this limit is approximately 50 years or older, and were very surprised when informed that after 43 years of age the success rates for IVF with a woman’s own eggs (unless eggs have been frozen earlier) drop to a few percent (CDC et al. 2016).

Given that many of the participants did not know about the age limits of IVF with a woman’s own eggs, and did not know about elective egg freezing or

what it is intended for, nor about IVF with donor eggs, this means that when they expressed positive views about how technology could help with age-related infertility they were mainly thinking that IVF with the woman's own eggs was possible at these advanced ages without prior egg banking. In none of the groups was it mentioned in reference to cases of women becoming mothers at above 45–50 years of age (or even in cases of women 60–65 years old) that this must have involved IVF using donor eggs.

Whilst most participants expressed positive views about the high success rates of IVF, some participants were less optimistic about technology regarding how well it could help with infertility problems, and some emphasized that these technologies can help to a lesser degree when women are older. Another argument against the usefulness of technology was that it was expensive, so not everyone had access to it.

### *The use of information sources in the interpretation process*

#### **Media as a conversational resource**

During the discussions, reference was made to the media: mainly to “soft” news stories centering on the lives of famous or non-famous individuals, or fictitious stories containing example cases. All of the examples involved cases with positive outcomes such as success stories about motherhood in general, or specifically involving motherhood at an advanced age.

Those who endorsed the fertility myths about advanced-age motherhood often relied on positive examples from the media in their reasoning. A popular reference point was the media story of a sixty-year-old mother; otherwise the references mainly pertained to celebrities giving birth at an advanced age. Based on these media stories of advanced maternal age, generalizations were sometimes made and it was argued that the relationship between age and fertility was very context-dependent, or at least that it was possible to get pregnant at these (advanced) ages.

“Jennifer: I read somewhere about a woman who got pregnant at the age of sixty, when in theory that can't happen ... in short, the level of fertility depends very much on the individual...”

From all the twelve focus group discussions, there was only one reference to a general article containing not a concrete case but a discussion about the relationship of age and fertility. It is notable that the female university student who mentioned reading this article later went on to talk of a media story about

a woman becoming a mother at the age of 60 without problematizing the issue of how this was possible.

“Moderator: What do you think: is there a connection between age and how easily a woman becomes pregnant and gives birth?”

Lily: Yes... Just last week I read an article about how a woman’s eggs and the chance of becoming pregnant decline with age and are much less at over 30 or over 35... Obviously, there are women who give birth at the age of 60.”

Generalizing using individual media cases also occurred to support the argument that psychological factors matter – and that, to an extent, these can diminish the effect of age. One case that was reiterated involved a Hungarian media celebrity giving birth naturally after having a child with IVF, and another involved Charlotte from the *Sex and the City* series who gave birth to a baby after adopting a child.

Examples of success stories from the media were also brought up regarding technologies, and sometimes an explicit link was made between these and conclusions about the positive role of IVF in helping with infertility:

“Kate: The last time I read about that was when Nóra Ördög had a child using IVF. It took a long time, but in the end she had a child. If I think about the question from this angle, it’s a really good possibility.”

IVF with sperm donation was mentioned based on examples from fictional films, while IVF and surrogacy were brought up repeatedly based on cases of celebrities using them, or fictional stories or films. When the outcome of the procedures in these examples was referred to in the discussions it was always positive. No media case was mentioned when the would-be mother used IVF with donor eggs. A surrogacy case which captured the attention of a few of the respondents involved a mother having her daughter’s child to help with her daughter’s infertility. This example was actually brought up to support arguments about how technologies can work even with older women. Thus, surrogacy was perceived by the participants to be present in the media as a topic which they knew about, although they did not recall having heard of IVF with donor eggs from the media, and consequently hardly anyone knew about its existence.

Although many of the participants said that for them the message of the media regarding technologies was that they could help, for a few interviewees the media image of success stories was not interpreted to mean that such technologies were available to everyone, but rather that it showed that having money and being a celebrity gave one opportunities that ordinary people did not have.

“Moderator: And what do you think is the message the media sends about the role and importance of technology?”

Sandra: Stars can do anything.

Lily: That they can afford it.”

In one of the groups the opinion arose that success stories in the media make individuals believe things that they would like to be true (such as women being able to get pregnant at whatever age they want). Thus, the strength of believing in fertility myths for some women might lie in the fact that they are preferable to engaging with reality, and they alleviate worry.

“Lidia: This picture may even show what we would like to see. That we would like to believe that it’s not too late for us, that we can succeed at any time, and really, the media often shows what you would like to see, not necessarily what is correct.”

### **Information from acquaintances and family members as a conversational resource**

Besides the media, another form of reference that appeared repeatedly in the reasoning of the participants was examples of the experiences of family members or acquaintances.

Hasty generalizations based on the experiences of acquaintances were mainly in line with the fertility myth about advanced maternal age. In several groups, cases of acquaintances getting pregnant after the age of 40 were brought up to support arguments about how easy it is to get pregnant at this age. In these instances involving the logical fallacy of hasty generalization, the line of argumentation was that as the person in the example had been successful, being able to get pregnant was not so strongly related to age. Such generalizations were often made using a single case. Accordingly, logical fallacies were demonstrated by the group members regarding understanding of the relationship between two factors: even one successful case was used to illustrate the argument that one cannot establish the fact that aging decreases fertility.

“Moderator: And in your opinion, how easy is it to get pregnant at around 40 or 45?”

Dora: I have an acquaintance who is 44 and had a child last year, but it wasn’t difficult for her to get pregnant and she wanted a child. So perhaps this is not so much linked to age.”

“Moderator: Then how closely are the two linked? How easy or difficult is it to get pregnant at a certain age?”

Sarah: I just recently met a woman who had twins with no problem at the age of 40, and there was nothing at all, no complications at all, so we can’t say that in general age makes this more difficult...”

However, a few other cases were brought up, such as that of a woman who had had more difficulty getting pregnant in older age than when she was younger, to

support the hypothesis of an age-related fertility decline. These cases involved closer family members, whereas successful cases were mentioned in reference to a wide array of acquaintances.

Some participants knew people that take part in IVF. Arguments for the great success of technological assistance were also presented, sometimes based on these cases. Sometimes a hasty generalization was made: respondents argued that as the medical process had worked for their acquaintances, they thought that such techniques in general could help and were quite successful. Such generalizations were often made using a single case. Some participants expressed less optimistic opinions about how well technology could help with infertility problems. These respondents often supported their statements with reference to the experiences of people they know – mainly relatives. Again, hasty generalization about the utility of such technology was often based on the example of just one person.

“Clara: But I think it is difficult (for technologies to help), because my godmother is struggling with this problem, and they haven’t been able to help her.”

“Moderator: And what do you think: how successful is IVF?”

Scarlett: I have an aunt who tried, as far as I know... unfortunately, I don’t know how many times, but it wasn’t successful. I have the impression that it isn’t very successful, it doesn’t work in the majority of cases.”

Negative experiences of relatives with IVF were also mentioned, but it was also argued that for others it did seem to help (for example, as seen in the media), so the final conclusions were optimistic.

No cases were reported involving acquaintances being told that they could not have IVF because of age, or where it was clearly understood that fertility was an age-related problem. Also, IVF with donated eggs was not mentioned in any of the groups in relation to an acquaintance.

According to respondents’ accounts, infertility and reproductive technologies were not a topic of discussion between these young women and their families/acquaintances unless there was a family member/acquaintance dealing with this problem. The pressure to have a child (“the sooner the better”) from their family members and older relatives was felt by some of the MA students – but in these discussions age-related fertility decline did not come up as a topic.

### **Information learnt in school as conversational resource**

Information learnt in school was rarely referred to. Some respondents openly said that the emphasis in school with respect to fertility was on how easily one

could get pregnant, connected with arguments for the importance of using contraception. If biology classes were mentioned, it was mainly in reference to the claims of respondents that they could not remember what they had been taught about infertility.

## DISCUSSION AND CONCLUSIONS

Study of lay reasoning in focus groups shows that although most participants had a general sense that age and fertility were related, there were gaps in the knowledge regarding the degree of fertility decline, the timing of the fertility decline, as well as the end of fertility. Elements of the knowledge gap in the lay understanding included not knowing the biological causes of age-related fertility decline, and not knowing that, beyond a certain age, IVF only makes sense with donor eggs. There also seemed to be issues in the group with understanding the logical relationship between two factors and the related probability of their association (age-fertility). In the lay reasoning in the group discussions, fertility and technology myths surfaced again and again. The chances of advanced-age genetic motherhood were often overestimated, and the relationship between age and fertility underrated. Many respondents were very optimistic about how technology could help with genetic motherhood at an advanced age.

An important phenomenon that arose in the discussions of these young women about age-related fertility problems was resistance to the idea of personal risk. This underscores the arguments contained in the contextual approaches of science and technology studies involving science/health communication which emphasize that diverse social-psychological phenomena interact when health risk information is received (Gallagher – Updegraff 2012). In the groups, resistance arose to the idea of respondents themselves having to deal with age-related fertility decline in the future. Many participants emphasized factors that they felt to be more important than age for fertility (e.g. a healthy lifestyle), perhaps wanting to reassure themselves that they could maintain control of their reproductive possibilities. In many groups there were attempts to underestimate the effect of age, and to emphasize that the impact of age on fertility was very “individual,” and did not apply to everybody. Denial was also apparent in the fact that respondents categorized themselves as healthy, in contrast to the ill people who would have infertility problems. Resistance was also a recurrent hallmark of reactions to the pressure that our respondents felt they faced from society and family to have a child as soon as possible. A few participants openly admitted that they would prefer to believe the success stories that the media

presented them with. The results show that making sense of the issue of fertility decline involves more than just acknowledging that such a phenomenon exists (many of the respondents did acknowledge this), but a second step – admitting that this issue might potentially apply to them in the future – was often missing. Some of the sample did not believe in their vulnerability to the threat of age-related fertility decline.

Maeda et al. (2016) found that the probability of feelings of anxiousness increased among respondents linearly with age after the latter were informed of facts about the age-related fertility decline. In the current study, anxiety was not voiced, but rather resistance towards the idea that infertility is an issue that the respondents would have to deal with in their own lives. However, not only was the sample small, but it was comprised of a specific demographic group: young university students. Further research is needed to investigate the range of reactions and beliefs among reproductive-age women of other ages.

The results also illustrate the power of examples in the reasoning process – an argument that exemplification theory researchers have been making for some time in other topics (Zillman 1999, 2006). Exemplification researchers have argued that the way information is formulated can influence how it is received, and that if a media story contains an example case this can have a greater effect on opinions than if statistics are presented (Hastall et al. 2013). A prominent mode of making sense of age-related fertility decline and the role of technology in the group discussions was reference to examples of cases in the media and to cases of acquaintances, family members, and friends. Often the logical fallacy of hasty generalization was employed openly, or sometimes implicitly in respect to these cases. Most of these hasty generalizations were made in line with, or in support of, fertility and technology myths (although in the case of closer acquaintances who had experience with the related technology, examples of the failure of technology were sometimes mentioned).

The accounts suggest that there might be some asymmetry in the visibility of success and failure. Success stories were highly visible to group members both in the media and with acquaintances. Acquaintances and media actors did not even have to talk about the details: the mere fact that a baby had been born at a certain maternal age signaled to many research subjects the possibilities and sometimes even the ease of motherhood at that age. With the postponement of parenthood, more women are having children in Hungary at advanced ages than in earlier decades (Kamarás 2012), thus one is more likely to meet women who became mothers at an advanced age than earlier, which might be strengthening perceptions of success.

In contrast, age-related fertility problems seem to have low visibility. In some cases acquaintances do not speak about fertility problems to others – except

perhaps to family and some close friends (at least this seems to be the case with the research participants' acquaintances). Thus, people might not know that their acquaintances are struggling with fertility problems. Moreover, according to the perceptions of the participants, age-related fertility decline as a topic was basically absent from the media.

It was also notable how the school and family were places where the sample of young adults were given no information about age-related fertility decline. This may be because the focus of sex education in schools on not getting pregnant at a young age emphasizes how easy it is to become pregnant, and also because the respondents' parents' generation did not have to deal with consequences of postponed childbirth to such a degree.

There is also the problem of the complexity of factors in each individual case which may contribute to the low visibility of the problem amongst the lay population. It can be hard to separate the effect of age from that of illness, which can also be age-related, thus some fertility problems might be attributed to this factor (Mills et al. 2014). How gynecologists communicate these issues with patients might also affect how the latter think about their infertility problems and what they communicate about them to others, including whether they are related to age-related fertility decline. Mac Dougall et al. (2013) argue that the extent of age-related fertility decline is not appreciated by many physicians who are not infertility specialists. There are some indications that this might be the case in Hungary, although I have not investigated this systematically. If this were indeed the case (that gynecologists underplay the role of age-related infertility), it could also contribute to the knowledge deficit of the lay population.

The results of the current study on the existence of fertility and technology myths are consistent with previous research that has shown knowledge gaps and the frequent presence of overly positive beliefs about reproductive possibilities (Bretherick et al. 2010, Bunting et al. 2013, Conceição et al. 2017, Cooke et al. 2012, Daniluk – Koert 2015, Daniluk et al. 2012, Friese et al. 2006, Hashiloni-Dolev et al. 2011, Hewlett 2002, Gossett et al. 2013, Lampic et al. 2006, Maheshwari et al. 2008; Maeda et al. 2016; Mac Dougall et al. 2013, Peterson et al. 2012). Additionally, work has shown that some lay people are of the view that a healthy lifestyle can offer a level of protection against age-related infertility (Bunting et al. 2013). The current work contributes to the above (mainly quantitative) body of work and extends it by giving a rich and deep description of the sense-making process and lay reasoning present in group discussions with young women in Hungary. It shows how these young women rely on information sources in their reasoning, and demonstrates that resistance and exemplification are two social-psychological phenomena which can be present in these interpretation processes and which can contribute

to overly positive assessments of respondents' future relationship with age-related fertility decline.

The limitations of the study include its non-representative nature. However, as the results discussed in the article were repeated in multiple focus groups, they might also be of relevance outside the specific situation of the focus groups they originated in. Whilst the situation in Hungary may be distinct in some aspects compared to that of other countries,<sup>2</sup> the results suggest that there are benefits to studying the reasoning processes underlying technology and fertility myths.

## REFERENCES

- American College of Obstetricians and Gynecologists (ACOG) Committee on Gynecologic Practice, – Practice Committee of the American Society for Reproductive Medicine (ASRM) (2014), “Female age-related fertility decline, Committee Opinion No. 589”, *Fertility and Sterility*, 101, pp. 633-634, <https://doi.org/10.1016/j.fertnstert.2013.12.032>.
- Baldwin, K., Culley, L., Hudson N., and Mitchell, H. (2014), “Reproductive Technology and the Life Course: Current Debates and Research in Social Egg Freezing” *Human Fertility*, 17, pp. 170–179. <https://doi.org/10.3109/14647273.2014.939723>
- Bauer, Zs. (2014a), “Systematic inequalities in medically assisted reproduction in Hungary – the patients' perspective – STS Conference – Graz, 5-6 May 2014”, *Proceedings: STS Conference Graz 2014: Critical Issues in Science and Technology Studies ISSN: 2304-4233*, Retrieved from: <http://www.ifz.aau.at/ias/IAS-STs/Publications/Proceedings-STs-Conference-Graz-2014>.
- Bauer, Zs. (2014b), “Laikus szakértő páciensek, avagy a változó orvos- beteg viszony megélése és értékelése a meddőségkezelési eljárásban”, *Kultúra és Közösség*, 3, pp. 159-172.
- Bay, J. L. – Mora, H. A.- Sloboda, D. M. – Morton, S. M. – Vickers, M. H., – Gluckman, P. D. (2012), “Adolescent understanding of DOHaD concepts: A school-based intervention to support knowledge translation and behavior change” *Journal of Developmental Origins of Health and Disease*, 3, pp. 469-482. <https://doi.org/10.1017/S2040174412000505>

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2 For example, there may be even less knowledge in Hungary than in countries like the USA where elective egg freezing is legal and advertisements draw attention to the phenomenon of age-related fertility decline, and also where the plans of some companies to offer elective egg freezing have been covered in high-profile media stories.

- Braun, V., and Clarke, V. (2006), Using Thematic Analysis in Psychology. *Qualitative Research in Psychology*, 3, pp.77–101. <https://doi.org/10.1191/1478088706qp063oa>
- Bucchi, M. (2008), Of deficits, deviations and dialogues: “Theories of public communication of science”. In M. Bucchi and B. Trench (Eds.) *Handbook of Public Communication of Science and Technology*, London, UK, Routledge, pp. 57-76.
- Bretherick, K. L., Fairbrother, N., Avila, L., Harbord, S. H. A., and Robinson W. P. (2010), “Fertility and aging: Do Canadian women know what they need to know?” *Fertility and Sterility*, 93, pp.2 162–2168. <https://doi.org/10.1016/j.fertnstert.2009.01.064>
- Bunting L, Tsibulsky I, Boivin J. (2013), “Fertility knowledge and beliefs about fertility treatment: findings from the international fertility decision-making study”. *Human Reproduction*, 28, pp. 385–397. <https://doi.org/10.1093/humrep/des402>
- Champlin, S., Mackert, M., Glowacki, E. M., and Donovan, E. E. (2016), “Toward a Better Understanding of Patient Health Literacy. A Focus on the Skills Patients Need to Find Health Information”, *Qualitative Health Research*, First published date: 12 May, 2016. Retrieved from: <http://journals.sagepub.com/doi/abs/10.1177/1049732316646355>, <https://doi.org/10.1177/1049732316646355>.
- Centers for Disease Control and Prevention (CDC), American Society for Reproductive Medicine, -Society for Assisted Reproductive Technology (2016), *2014 Assisted Reproductive Technology National Summary Report*. Atlanta, GA: US Dept of Health and Human Services.
- Conceição, C., Pedro, J., and Martins, M. V. (2017), “Effectiveness of a video intervention on fertility knowledge among college students: a randomized, pretest-posttest study”, *The European Journal of Contraception and Reproductive Health Care*, 22, pp. 107-113. <https://doi.org/10.1080/13625187.2017.1288903>
- Cooke, A., Mills, T. A., and Lavender, T. (2012), “Advanced Maternal Age: Delayed Childbearing Is Rarely a Conscious Choice. A Qualitative Study of Women’s Views”, *International Journal of Nursing Studies*, 49, pp. 30-39. <https://doi.org/10.1016/j.ijnurstu.2011.07.013>
- Dahlstrom, M. F. (2014), “Using narratives and storytelling to communicate science with nonexpert audiences”, *Proceedings of the National Academy of Sciences*, 111, pp. 13614-13620. <https://doi.org/10.1073/pnas.1320645111>
- Daniluk, J.C., Koert, E. (2015), “Fertility awareness online: the efficacy of a fertility education website in increasing knowledge and changing fertility beliefs”, *Human Reproduction*, 30, pp. 353-363. <https://doi.org/10.1093/humrep/deu328>

- Daniluk, J. C., Koert, E., Cheung, A. (2012), "Childless women's knowledge of fertility and assisted human reproduction: Identifying the gaps", *Fertility and Sterility*, 97, pp. 420–426. <https://doi.org/10.1016/j.fertnstert.2011.11.046>
- Ezrahi, Y. (2008), "Controlling biotechnology: Science, democracy and "civic epistemology"", *Metascience*, 17, pp. 177–198. <https://doi.org/10.1007/s11016-008-9201-6>
- Fogg-Rogers, L., Bay, J. L., Burgess, H., and Purdy, S. C. (2015), ""Knowledge Is Power": A Mixed-Methods Study Exploring Adult Audience Preferences for Engagement and Learning Formats Over 3 Years of a Health Science Festival", *Science Communication*, 37, pp. 1-33. <https://doi.org/10.1177/1075547015585006>
- Friese, C., Becker, G., Nachtigall, R. D.(2006), "Rethinking the biological clock: Eleventh-hour moms, miracle moms and meanings of age-related infertility", *Social Science & Medicine*, 63, pp. 1550-60. <https://doi.org/10.1016/j.socscimed.2006.03.034>
- Gallagher, K. M., and Updegraff, J. A. (2012), "Health message framing effects on attitudes, intentions, and behavior: A meta-analytic review", *Annals of Behavioral Medicine*, 43, pp.101- 116. <https://doi.org/10.1007/s12160-011-9308-7>
- Gamson, W. A. (1992). *Talking Politics*. Cambridge, UK, Cambridge University Press.
- Gossett, D. R., Nayak, S., Bhatt, S., and Bailey, S. C. (2013), "What do healthy women know about the consequences of delayed childbearing?" *Journal of Health Communication*, 18(sup1), 118-128. <https://doi.org/10.1080/10810730.2013.825677>
- Hastall, M. R., and Knobloch-Westerwick, S. (2013), "Severity, efficacy and evidence type as determinants of health message exposure", *Health Communication*, 28, pp. 378-388. <https://doi.org/10.1080/10410236.2012.690175>
- Hansen, T., Slagsvold, B., and Moum, T. (2009), "Childlessness and Psychological Well-Being in Midlife and Old Age: An Examination of Parental Status Effects Across a Range of Outcomes", *Social Indicators Research*, 94, pp. 343-362. <https://doi.org/10.1007/s11205-008-9426-1>
- Hashiloni-Dolev, Y., Kaplan, A., and Shkedi-Rafid, S. (2011), "The fertility myth: Israeli students' knowledge regarding age-related fertility decline and late pregnancies in an era of assisted reproduction technology", *Human Reproduction*, 26, pp. 3045-3053. <https://doi.org/10.1093/humrep/der304>
- HCOG (2012), *Clinical protocols regarding infertility and IVF issued by the Hungarian College of Obstetricians and Gynecologists* (valid 2010-2012). Retrieved 3.3.2014. from: [www.eum.hu/egeszsegpolitika/minosegfejlesztes/he-2010-30](http://www.eum.hu/egeszsegpolitika/minosegfejlesztes/he-2010-30).

- Hewlett, S. (2002), *Creating a Life: Professional Women and the Quest For Children*. New York, NY, Talk Miramax Books.
- Hinnant, A., and Len-Ríos, M. (2009), “Tacit Understandings of Health Literacy”, *Science Communication*, 31, pp. 84-115.
- Jarrett, M. E., and Lethbridge, D. J. (1994), “Looking forward, looking back: women's experience with waning fertility during midlife”, *Qualitative Health Research*, 4, pp. 370–84.
- Kapitány, B. (2012), “A gyermekvállalási tervek beteljesületlenségének okai”, *Korfa*, 12, pp. 1-4.
- Kapitány, B. and Spéder, Zs. (2015), Fertility. In J. Monostori, P. Óri, – Zs. Spéder (Eds.) *Demographic Portrait of Hungary*, Budapest, HDRI, pp. 41-56.
- Kamarás, F. (2012), “A születések és a termékenység hazai irányzatai”, *Demográfia*, 55, pp. 243–267.
- Kotchetkova, I., Evans, R., and Langer, S. (2008), “Articulating contextualized knowledge: Focus groups and/as public participation?” *Science as Culture*, 17, pp.71-84. <https://doi.org/10.1080/09505430701872897>
- Kreps, G.L. and Thornton, B. C.(1992), *Health communication : theory & practice*. 2<sup>nd</sup>ed. Prospect Heights, Ill., Waveland Press.
- Kreuter, M. W., and McClure S. M. (2004), “The Role of Culture in Health Communication”, *Annual Review of Public Health*, 25, pp. 439-455. <https://doi.org/10.1080/09505430701872897>
- Központi Statisztikai Hivatal (KSH) (2016), *Népesedési helyzetkép, 2015*, Budapest, KSH.
- Lampic, C., Skoog Svanberg, A., Karlstrom P., – Tyden, T. (2006), “Fertility awareness, intentions concerning childbearing, and attitudes towards parenthood among female and male academics”, *Human Reproduction*, 21, pp.558-564. <https://doi.org/10.1093/humrep/dei367>
- Leridon, H. (2004), “Can assisted reproduction technology compensate for the natural decline infertility with age? A model assessment”, *Human Reproduction*, 19, pp. 1548–1553. <https://doi.org/10.1093/humrep/deh304>
- Lewenstein (2003), *Models of public communication of science and technology*, Manuscript. Retrieved 3.3. 2014 from: [https://edisciplinas.usp.br/pluginfile.php/43775/mod\\_resource/content/1/Texto/Lewenstein%202003.pdf](https://edisciplinas.usp.br/pluginfile.php/43775/mod_resource/content/1/Texto/Lewenstein%202003.pdf)
- Lundsberg, L.S., Pal, L., Garipey, A.M., Xu, X., Chu, M.C., and Illuzzi, J.L. (2014), “Knowledge, attitudes, and practices regarding conception and fertility: a population-based survey among reproductive-age United States women”, *Fertility and Sterility*, 101, pp. 767–774. <https://doi.org/10.1016/j.fertnstert.2013.12.006>
- Mac Dougall, K., Beyene, Y., and Nachtigall, R. D. (2013), “Age shock: misperceptions of the impact of age on fertility before and after IVF in women

- who conceived after age 40” *Human Reproduction*, 28, pp. 350–356. <https://doi.org/10.1093/humrep/des409>
- Macintosh, K. L. (2015), “Teaching About the Biological Clock: Age-Related Fertility Decline and Sex Education” *UCLA Women's Law Journal*, 22, pp. 1-38. Retrieved 2.4.2017 from: <http://escholarship.org/uc/item/5b1147x9>.
- Maeda, E., Nakamura, F., Kobayashi, Y., Boivin, J., Sugimori, H., Murata, K., and Saito, H. (2016), “Effects of fertility education on knowledge, desires and anxiety among the reproductive-aged population: findings from a randomized controlled trial”, *Human Reproduction*, 31, pp. 2051–2060. <https://doi.org/10.1093/humrep/dew133>
- Maheshwari, A., Porter, M., Shetty, A., Bhattacharya, S. (2008): “Women's awareness and perceptions of delay in childbearing”, *Fertility and Sterility*, 90, pp. 1036–42.
- Miller-Day, M., and Hecht, M. L. (2013), “Narrative means to preventative ends: a narrative engagement framework for designing prevention interventions”, *Health communication*, 28, pp. 657-670. <https://doi.org/10.1080/10410236.2012.762861>
- Mills, M., Rindfuss, R. R., McDonald, P., te Velde, E. on behalf of the ESHRE Reproduction and Society Task Force (2011), “Why do people postpone parenthood? Reasons and social policy incentives” *Human Reproduction Update*, 17, pp. 848–860. <https://doi.org/10.1016/j.srhc.2014.10.005>
- Mills, T.A., Lavender, R., and Lavender, T. (2014), ““Forty is the new twenty”: an analysis of British media portrayals of older mothers”, *Sexual & Reproductive Healthcare*, 6, pp. 88-94.
- Miettinen, A. and Szalma, I. (2014): “Childlessness Intentions and Ideals in Europe”, *Finnish Yearbook of Population Research*, XLIX, pp. 31–55.
- Mesen, T.B., Mersereau, J. E., Kane, J. B., and Steiner, A.Z. (2015), “Optimal timing for elective egg freezing”, *Fertility and Sterility*, 103, pp. 1551-1556. <https://doi.org/10.1016/j.fertnstert.2015.03.002>
- Meyer, G. (2016), “In science communication, why does the idea of a public deficit always return?” *Public Understanding of Science*, 25, pp. 433-446. <https://doi.org/10.1177/0963662516629747>
- Organisation for Economic Co-operation and Development (OECD) (2016), *OECD Family Database, Indicator SF2.1, “Fertility Rates”*. Retrieved 2.4. 2017 from: [https://www.oecd.org/els/family/SF\\_2\\_1\\_Fertility\\_rates.pdf](https://www.oecd.org/els/family/SF_2_1_Fertility_rates.pdf)
- Petropanagos, A.(2010), “Reproductive ‘Choice’ and Egg Freezing”, *Cancer Treatment and Research*, 156, pp. 223-235. [https://doi.org/10.1007/978-1-4419-6518-9\\_17](https://doi.org/10.1007/978-1-4419-6518-9_17)
- Peterson, B. D., Pirritano, M., Tucker L., and Lampic, C. (2012),” Fertility awareness and parenting attitudes among American male and female

- undergraduate university students”, *Human Reproduction*, 27, pp. 1375–1382, <https://doi.org/10.1093/humrep/des011>
- Präg, P. – M.C. Mills. (2017a), “Cultural determinants influence assisted reproduction usage in Europe more than economic and demographic factors”, *Human Reproduction*, 32(11), pp. 2305-2314, <http://dx.doi.org/10.1093/humrep/dex298>
- Präg, P. – M. C. Mills (2017b), “Assisted Reproductive Technology in Europe: Usage and Regulation in the Context of Cross-Border Reproductive Care,” in: M. Kreyenfeld – D. Konietzka (Eds.) *Childlessness in Europe: Contexts, Causes and Consequences*. New York, Springer, pp. 289-309,
- Sándor, J. – Vicsek, L. – Bauer Zs. (2017), „Let us talk about eggs! Professional resistance to elective egg vitrification and gendered medical paternalism”, *Medicine, Health Care and Philosophy* , 21(3), pp. 311-323. <https://doi.org/10.1007/s11019-017-9805-y>
- Shkedi-Rafid, S. and Hashiloni-Dolev, Y. (2012), “Egg freezing for non-medical uses: the lack of a relational approach to autonomy in the new Israeli policy and in academic discussion”, *Journal of Medical Ethics*, 38, pp. 154-157. <https://doi.org/10.1136/medethics-2011-100088>
- Sobotka, T. (2004), *Postponement of childbearing and low fertility in Europe*. Doctoral Thesis: University of Groningen.
- Sobotka, T. (2017): “Post-transitional fertility”, *J Biosoc Sci*, Vol. 49, Nov, pp. 20-45. <https://doi.org/10.1017/S0021932017000323>
- Soini, S., Ibarreta, D., Anastasiadou, V., Ayme, S., Braga, S., Cornel, M....ESHRE(2006), “The interface between assisted reproductive technologies and genetics: technical, social, ethical and legal issues”, *European Journal of Human Genetics*, 14, pp. 588-645. <https://doi.org/10.1038/sj.ejhg.5201598>
- Sorensen, G., Stoddard A., Dubowitz, T., Barbeau, E.M., Bigby J., Emmons, K. M., Berkman, L.F., Peterson, K. E. (2007), “The influence of social context on changes in fruit and vegetable consumption: results of the Healthy Directions Studies”, *American Journal of Public Health*, 97, pp. 1216–27. <https://doi.org/10.2105/AJPH.2006.088120>
- Spéder, Zs. (2014), Gyermekszám(szcenáriók) – Az új családmodell kontúrjai. In Zs. Spéder (Ed.): *A család vonzásában – Tanulmányok Pongrácz Tiborné tiszteletére*. KSH Népeségtudományi Kutatóintézet: Budapest, pp.105-128.
- Stern, J., Larsson, M., Kristiansson, P., and Tydén, T. (2013), “Introducing reproductive life plan-based information in contraceptive counselling: An RCT”, *Human Reproduction*, 28, pp. 2450–2461.
- Stewart, D. W., Shamdasani, P. N., and Rook, D. W. (2007), *Focus Groups: Theory and Practice* (2<sup>nd</sup> ed.). Thousand Oaks, CA: Sage.

- Szalma, I. – Takács, J. (2012), “A gyermektelenséget meghatározó tényezők Magyarországon”, *Demográfia*, 55, pp. 44–68.
- Szalma I. (2014), „A gyermekvállalás társadalmi normái és a mesterséges megtermékenyítéssel kapcsolatos attitűdök vizsgálata Magyarországon és Európában”, *Replika*. 85-86, pp. 35-57.
- Szalma I. – Takács J. (2014), „Germéktelenség és ami mögötte van”, *Demográfia*, 57. évf. 2–3. szám, pp. 109–136. file:///C:/Users/Corvinus/Downloads/2477-2336-1-PB.pdf
- Szalma I. – Takács J. (2015), “Who Remains Childless? Unrealized Fertility Plans in Hungary”, *Sociologicky časopis/Czech Sociological Review*, 51(6), pp. 1047-1075. <http://dx.doi.org/10.13060/00380288.2015.51.6.228>
- Takács, E. (2016), “Mechanisms of power, victimization and autonomy in the health care system”, *Metszetek*, 5, pp. 60-80.
- Practice Committees of the American Society for Reproductive Medicine (ASRM) and the Society for Assisted Reproductive Technology (SART) (2013), “Mature oocyte cryopreservation: a guideline”, *Fertility and Sterility*, 99, pp. 37–43.
- Vicsek L. (2007) “A Scheme for Analyzing the Results of Focus Groups”, *International Journal of Qualitative Methods*, 6 (4), pp. 20-34. <https://doi.org/10.1177/160940690700600402>,
- Wojcieszek, A.M., Thompson, R. (2013), “Conceiving of change: a brief intervention increases young adults’ knowledge of fertility and the effectiveness of in vitro fertilization”, *Fertility and Sterility*, 100, pp. 523-529. <https://doi.org/10.1016/j.fertnstert.2013.03.050>
- Yu, L., Peterson, B., Inhorn, M. C., Boehm, J. K., and Patrizio, P. (2016), “Knowledge, attitudes, and intentions toward fertility awareness and oocyte cryopreservation among obstetrics and gynecology resident physicians”, *Human Reproduction*, 31, pp. 403-411. <https://doi.org/10.1093/humrep/dev308>
- Zillmann, D. (1999), Exemplification theory: Judging the whole by some of its parts. *Media Psychology*, 1, pp. 69–94. [https://doi.org/10.1207/s1532785xmep0101\\_5](https://doi.org/10.1207/s1532785xmep0101_5)
- Zillmann, D. (2006), Exemplification Effects in the Promotion of Safety and Health. *Journal of Communication*, 56, pp. 221–237. <https://doi.org/10.1111/j.1460-2466.2006.00291.x>

