



# Partnership trajectories preceding medically assisted reproduction

Alina Pelikh, Hanna Remes, Niina Metsä-Simola & Alice Goisis

**To cite this article:** Alina Pelikh, Hanna Remes, Niina Metsä-Simola & Alice Goisis (2023): Partnership trajectories preceding medically assisted reproduction, *Population Studies*, DOI: 10.1080/00324728.2023.2215213

**To link to this article:** <https://doi.org/10.1080/00324728.2023.2215213>



© 2023 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group



[View supplementary material](#)



Published online: 13 Jun 2023.



[Submit your article to this journal](#)



Article views: 311



[View related articles](#)



[View Crossmark data](#)

# Partnership trajectories preceding medically assisted reproduction

Alina Pelikh <sup>1</sup>, Hanna Remes <sup>2</sup>, Niina Metsä-Simola <sup>2</sup> and Alice Goisis <sup>1</sup>  
<sup>1</sup>University College London, <sup>2</sup>University of Helsinki

*The number of people who undergo medically assisted reproduction (MAR) to conceive has increased considerably in recent decades. However, existing research into the demographics and the partnership histories of this growing subgroup is limited. Using unique data from Finnish population registers on nulliparous women born in Finland in 1971–77 (n=21,129; ~10 per cent of all women) who had undergone MAR treatment, we created longitudinal partnership histories from age 16 until first MAR treatment. We identified six typical partnership trajectories and used relative frequency sequence plots to investigate heterogeneity in partnership transitions within and between these groups. The majority of women (60.7 per cent) underwent MAR with their first partner, followed by women who underwent MAR in a second (21.5 per cent) or higher-order partnership (7.1 per cent), while 10.7 per cent underwent MAR without a partner. On average, women undergoing MAR were relatively young (with around half starting treatment before age 30) and were highly educated with high incomes.*

Supplementary material for this article is available at: <http://dx.doi.org/10.1080/00324728.2023.2215213>

**Keywords:** medically assisted reproduction; partnership histories; sequence analysis; subfertility

[Submitted March 2022; Final version accepted November 2022]

## Introduction

Cultural and societal changes associated with the Second Demographic Transition (SDT) and the ‘gender revolution’ have contributed to the emergence of new partnership and childbearing behaviour (Lesthaeghe and van de Kaa 1986; Perelli-Harris et al. 2010; Goldscheider et al. 2015). The traditional routes of family formation and childbearing via marriage have been greatly affected by the spread of cohabitation and the gradual postponement of entry into first unions. As a consequence, larger shares of children are being born later and to unmarried parents (Kiernan 2001; Cherlin 2004; Seltzer 2004; Perelli-Harris et al. 2012). With union dissolution and repartnering also becoming more common, first children are increasingly being born to women in second or higher-order partnerships (Buber and Prskawetz 2000; Beaujouan and Solaz

2013; Ivanova et al. 2014; Guzzo 2017) or to women without a partner (Ellwood and Jencks 2004; Harkness et al. 2020). The increased complexity of partnership behaviour combined with the postponement of childbearing (Billari et al. 2006; Schmidt et al. 2012) may be leading to a decline in the realization of fertility intentions at later ages, particularly among women (Beaujouan et al. 2019; Beaujouan 2022).

Over the past two decades, these fundamental changes in partnership and fertility behaviour have been accompanied by additional changes in the pathways leading to childbearing, due to further advances in and wider availability of medically assisted reproduction (MAR), which includes treatments such as ovulation induction drugs, artificial insemination, and assisted reproduction technology (ART; including in vitro fertilization (IVF) and intracytoplasmic sperm injection (ICSI)). Since the

first IVF baby was born in 1978, more than 10 million children worldwide have been conceived with the help of ART (ESHRE 2022). Thus, this technology has enabled a larger proportion of the population to become parents or have additional children. The number of ART treatment cycles registered annually has been increasing rapidly in most countries over the last two decades (Wyns *et al.* 2021). Indeed, between 1997 and 2017, the proportion of infants born through ART in Europe increased from 1.3 to 3.1 per cent (Nygren and Andersen 2001; Wyns *et al.* 2021). Currently, Spain holds the record for the highest proportion of ART-conceived children among all births, at 7.9 per cent (Wyns *et al.* 2021).

Although the number of people turning to MAR treatment has been rising, research into the demographics and partnership histories of this growing subgroup is limited. Previous research has tended to ignore the role of subfertility and mode of conception in family formation behaviours. Currently, population-level statistics on the proportion and characteristics of women undergoing MAR treatment are lacking. There is evidence on the selective socio-demographic profile of couples who have conceived through MAR, showing that these couples are, on average, older at the time of birth, socio-economically advantaged (e.g. with higher levels of income and education), and likely to be married (Goisis *et al.* 2019, 2020; Barbuscia *et al.* 2020; Pelikh, Smith *et al.* 2022). However, it is unclear whether these findings accurately reflect the characteristics of women who *start* MAR treatment, because being married and having a higher socio-economic position may increase the probability of undergoing treatment for a longer period of time after the initial failure to conceive and thus increase the probability of having a live birth through MAR. Moreover, focusing on partnership status at the start of MAR treatment might conceal substantial differences in *prior* partnership trajectories. As the various and potentially unique partnership pathways preceding the start of MAR treatment have never previously been documented, described, or quantified, it is unclear whether the increasing complexity of partnership pathways among women who conceive naturally translates to those who use MAR to conceive.

Understanding the partnership trajectories of women who undergo MAR is relevant for three reasons. First, in light of decreasing total fertility, the general postponement of parenthood, and an increasing proportion of children conceived through MAR, studying the population of women who undergo MAR becomes increasingly important

for understanding its role in partnership and fertility behaviour and its contribution to overall fertility trends. Second, it contributes to our understanding of the family complexity in contemporary societies and of potentially new and emerging family forms (e.g. single individuals conceiving through MAR). Third, the pre-treatment partnership durations and histories of the growing subgroup of individuals undergoing MAR might affect their future partnership trajectories, their well-being, and (if they become parents) the well-being of their children.

This paper contributes to the literature by analysing the partnership histories of women who begin MAR treatment in Finland. We address the following research questions: What are the typical partnership trajectories of women before they undergo MAR? How heterogeneous are partnership transitions within and between typical partnership trajectories? Do women's socio-demographic characteristics differ between the trajectories? Has the prevalence of partnership trajectories that precede MAR changed across cohorts, and, if so, how? Using unique data from Finnish population registers that cover the whole population, we focused on nulliparous women born in 1971–77 who had started their first MAR treatment between 1995 and 2017, and we analysed their longitudinal partnership histories before they started MAR treatment, from age 16 up to age 40. We identified the typical partnership trajectories that preceded the start of MAR treatment and used relative frequency sequence plots (RFS) to investigate heterogeneity within and between the groups of women with different partnership pathways.

## **Background: Partnership trajectories and medically assisted reproduction**

Cultural changes associated with the SDT and the gender revolution, such as the contraceptive revolution and changes in gender norms, have resulted in more lifestyle choices open to people and thus increasing variation in the timing and sequence of life events in early adulthood (Shanahan 2000; Macmillan 2005; Billari and Liefbroer 2010). The increased participation of women in higher education and the labour market has changed women's perceptions of their personal goals and career prospects, enabling women to achieve higher levels of financial independence. These developments have, in turn, triggered changes in women's partnership formation and childbearing preferences, including the postponement of family formation, especially

among highly educated women (Ní Bhrolcháin and Beaujouan 2012; Goldscheider et al. 2015; Raybould and Sear 2021). Although the postponement of childbearing has been almost universal in developed countries, the partnership pathways leading to first parenthood have become more heterogeneous (Jalovaara and Fasang 2015; Mikolai 2017; Guzzo and Hayford 2020). In this section, we take as the starting point the literature on partnership trajectories that lead to first parenthood and discuss how it can help us understand the partnership trajectories that precede MAR, but we also reflect on the specific partnership trajectories of women who undergo MAR, given that they are experiencing subfertility or are seeking MAR to conceive without a partner.

The partnership trajectories of women undergoing MAR are likely to be varied. On the one hand, some women might follow the more ‘traditional’ pathway of undergoing MAR in a first union. Couples may resort to MAR after failing to conceive naturally for some period of time. On the other hand, given the increasing complexity of partnership trajectories, there are likely to be some individuals seeking MAR in a higher-order partnership or deciding to undergo MAR without a partner. The variety of partnership trajectories that might precede MAR is likely to reflect the growing complexity of individuals’ life courses, their changing fertility intentions, and their experiences of subfertility.

For example, for some women a first union might be associated with a more casual relationship, in which the partners do not have a long-term commitment or immediate plans to have children (Rindfuss and VandenHeuvel 1990; Heuveline and Timberlake 2004; Sassler 2004). Cohabiting couples in this type of union tend to be younger, and their relationships tend to be shorter (Manning and Smock 2002; Guzzo 2014; Lamidi et al. 2019; Pelikh, Mikolai et al. 2022). Some women seeking MAR in a higher-order partnership might have wanted children in their first union but separated from their partner before they tried to conceive (e.g. if the partner did not want to have a child at the time). Dissolution of the first union could lead to a more complex future partnership trajectory involving repartnering and higher-order (‘serial’) cohabitations (Cohen and Manning 2010; Lichter et al. 2010; Eickmeyer and Manning 2018).

Fertility intentions can also change over the life course, following a variety of life events or because of a shift in personal preferences (Hayford 2009; Iacovou and Tavares 2011; Rybińska and Morgan 2019; Kuhnt et al. 2021). Women who did not intend to have children in their first (previous)

union or who had been postponing the realization of their fertility intentions but then decided to pursue motherhood later in life might first learn about their subfertility at a higher age or might start trying to conceive when their overall chances of becoming pregnant are lower (ESHRE Capri Workshop Group 2005; Somigliana et al. 2016). Experiencing subfertility can affect the psychological and physical well-being of both partners, and this might cause relationship problems and lead to union dissolution (Dyer et al. 2002; Chachamovich et al. 2010; Luk and Loke 2015) even before the partners decide to undergo MAR. Such an experience could lead a woman to a search for a new partner and, if she is aware of her subfertility, to start MAR treatment shortly after the formation of the new union. Alternatively, a woman might decide to undergo MAR on her own if she cannot find a suitable partner or does not want to look for one after the psychological distress she experienced during the separation (Poortman 2007; Hart 2019).

There could also be very distinctive pathways preceding MAR among women with no previous partnerships. Recent studies have documented an increasing proportion of women who have never experienced a partnership (Bellani et al. 2017; Jalovaara and Fasang 2017; Raab and Struffolino 2020). Before MAR became available to single (i.e. unpartnered) women (in some countries, though still not in all), these women had restricted opportunities to have children and could often end up childless (Berrington 2017). A few studies have found that some women who underwent MAR alone reported that they would have preferred to be in a relationship instead of pursuing MAR on their own, but they believed that they could not afford to wait any longer for a suitable partner (Jadva et al. 2009; Graham and Braverman 2012).

Although we would theoretically expect to observe a variety of partnership trajectories preceding MAR, it is unclear how common or uncommon each of these trajectories is and whether they have changed across cohorts. There could be substantial differences in the timing and duration of union formation, the timing of MAR treatment, and the socio-economic status (SES) profiles of women who follow a particular partnership pathway before MAR. With the continuous postponement of first union formation associated with the SDT, there is evidence that the timing, duration, and outcomes of first unions might affect both future partnerships and future childbearing behaviour (Baizán et al. 2003; Poortman 2007; Hart 2019). Hence, we

can expect the timing and duration of first and subsequent unions to affect the timing of MAR directly. A higher age at union formation may, for instance, be associated with more accumulated resources (i.e. education and wealth), which might, in turn, lead to greater relationship stability (Smock and Manning 1997; Conger et al. 2010; Jalovaara 2013) and a decision to start MAR if the partners are unable to conceive naturally. Besides the general postponement of first union formation in developed countries, early life-course transitions (including first partnership transitions) have become more de-standardized and individualized over the past few decades (Shanahan 2000; Macmillan 2005; Billari and Liefbroer 2010). With the growing complexity of the life course and the higher prevalence of separation and repartnering among more recent cohorts, we can expect an increasing diversity of partnership pathways preceding MAR in these cohorts, including a rising proportion of women undergoing MAR in higher-order partnerships as well as single women deciding to become mothers on their own.

According to the SDT, new family behaviours which result from an ideational and value change towards greater freedom in personal life decisions usually emerge first among more liberal, secularized, and highly educated individuals (Lesthaeghe and Van de Kaa 1986; Liefbroer 1999; Mikolai 2012). MAR is still a relatively new and expensive technology, which may be more attractive for couples who are ready and willing to pay for a range of procedures to start a family. However, given the wider availability and acceptability of treatment in recent years (at least in the Nordic context), we would expect an increase in the use of MAR services across a wide range of SES groups in more recent cohorts.

Women who decide to start MAR without a partner might also represent a diverse group in terms of their socio-demographic characteristics, depending on when they decide to start the treatment and whether or not they have experienced a partnership. Given the strong fertility intentions of the women in this group, we would expect that a woman who decides to start MAR without a partner is likely to have accumulated enough resources to enable her to raise a child on her own. Given that over the last few decades, the number of women with the financial resources needed to pursue motherhood on their own has been increasing and the social acceptability of single motherhood has been growing, it is likely that among women who are prepared to pursue motherhood via MAR, the

proportion of single women will continue to grow in future.

In Finland, a high proportion of infertility treatments are publicly subsidized. Since the Act on Assisted Fertility Treatments (1237/2006) was implemented in 2007, access to infertility treatment in Finland has been permitted for heterosexual couples (married or cohabitating), female couples (married, in a registered partnership, or cohabitating), and single women. However, in practice, accessing publicly subsidized treatment has been more difficult for same-sex couples and single women. Like in other developed countries, a high proportion of first unions in Finland end in separation within the first few years of living together (Jalovaara 2013), which suggests that partnership trajectories are becoming more complex. At the same time, the proportions of never-partnered individuals and single parents have both remained stable (Jalovaara and Fasang 2015, 2017; Official Statistics of Finland 2021). Previous findings on partnership trajectories and childbearing contexts in Finland (Saarela and Finnäs 2014; Jalovaara and Fasang 2015; Hellstrand et al. 2020) indicate that the trajectories leading to first parenthood have become more diverse; however, it is unclear whether these trends apply to the growing group of individuals undergoing MAR and, if so, how.

## Method

### *Data and sample*

To study the partnership trajectories of nulliparous women who had started MAR treatment, we used unique rich data from Finnish population registers covering the whole population; these were provided by Statistics Finland. We analysed women born between 1971 and 1977 ( $n = 233,509$ ), following their partnership transitions from age 16 until their first MAR treatment (if any). We excluded women who had given birth to a child before 1996 ( $n = 25,057$ ; 10.7 per cent), because information on MAR treatment was available only from 1995. We also excluded women who had given birth outside Finland, as we could not determine whether or not these women had undergone MAR to conceive ( $n = 11,716$ , 5.0 per cent). We focused on women who had started MAR treatment by age 40 as we would have been able to show the longer sequences only for women in the earliest cohorts, since those born in 1977 had only reached age 40 by the end of the follow-up. This resulted in only a small exclusion,

as among the cohorts born in 1971 and 1972, who we could follow up to age 45, nearly 96 per cent of women had started their first treatment by their 40th birthday. Next, we identified women who had undergone MAR treatment at ages 20–39 between 1995 and 2017 ( $n = 21,129$ ; 9.0 per cent of all women born between 1971 and 1977 and 10.7 per cent of the sample after the exclusions just listed). We additionally excluded women who had not been counted in the Finnish population during all years between their 16th birthday and their first MAR treatment ( $n = 1,407$ ), as we would not have had information on their full partnership histories before starting MAR. The final sample consisted of 16,461 women who had started MAR treatment to conceive their *first* child (84.6 per cent of all women who had undergone MAR). To provide context and situate our results in women who undergo MAR to conceive, we additionally present the distribution of the partnership histories and socio-demographic profile of first-time mothers from the same birth cohorts who conceived naturally ( $n = 120,145$ ).

Analysing the partnership trajectories of women who were undergoing MAR treatment for higher-order conceptions (15.4 per cent) falls outside the scope of this paper. As the partnership trajectories of these women likely differed from those of women who were undergoing MAR treatment for a first conception, including them in the analysis would have required distinct theoretical arguments and a different empirical approach, not least because prior births would need to be incorporated. Although investigating the success rate of the MAR treatment is beyond the scope of this paper, it is important to note that approximately 70 per cent of women in the sample conceived with the same partner they started MAR with or while staying single between the start of MAR and conception.

#### *Identification of the start of MAR treatment*

We identified women who had undergone MAR treatment between 1995 and 2017 using a combination of data from three population registers: reimbursement records from the Finnish Prescription Register and data from the Care Register for Health Care and the Medical Birth Register of the Finnish Institute for Health and Welfare (with permission TK-52-1121-18 from the Ethics Committee of Statistics Finland). A summary table that lists all data sources and provides details on the identification of MAR treatments can be found in Table

A1 in the supplementary material. We believe that combining all these data sources provided us with the most accurate information available for identifying women who had undergone MAR. The data on drug purchases cover fertility drugs prescribed in both the public and private sectors, but we did not have access to data on MAR procedures performed in private clinics (the implications of this limitation are discussed in the Discussion section). To identify MAR treatments using the drug reimbursement records from the Finnish Prescription Register, we updated an algorithm developed by Hemminki et al. (2003) by including fertility drugs introduced after 2000. We defined the start of MAR treatment as the date of the first purchase of drugs specifically used for infertility treatment. Through the Care Register for Health Care, we had access to data on the dates and types of MAR procedures performed by public hospitals. Additionally, we had access to data on children conceived through MAR from 2004 onwards from the Medical Birth Register. Even if we could not verify that a woman whose first child was identified as having been conceived through MAR had indeed used MAR treatment based on records of her drug purchases or medical procedures, we nonetheless included her in the sample. As we had no direct information on when the MAR treatment had started for these cases, we imputed the date of the first treatment using age-specific durations for the average time between the start of MAR treatment and conception in our data (details of the data imputation can be provided on request).

#### *Partnership trajectories and sequence analysis*

We used total population data on cohabitation, compiled by Statistics Finland since 1987, to create longitudinal partnership histories of women who had undergone MAR. This data set contains individual-level data on the dates of moving in together, marriage, separation, divorce, and death of a partner. Statistics Finland provides data for opposite-sex couples whose union was intact at the end of a year, who had lived together for at least 90 days, and whose age difference was no more than 15 years (unless they were married). We defined the start of a partnership as the date the couple had moved in together or the date of marriage, if earlier. We defined the end of a partnership as the date when either partner had moved out of the joint household, the couple had obtained a formal divorce, or the male partner had died.

To create and investigate the partnership histories of women undergoing MAR treatment, we represented each individual life course with a string of states following a sequence analysis approach (Abbott and Tsay 2000). To create individual sequences, we first defined five potential partnership states that the women may have gone through between age 16 and the start of MAR treatment by age 40: single (never cohabited), in a first partnership, in a second partnership, in a third/higher-order partnership, or separated. The first MAR treatment, our transition of interest, was the last state in the sequence, and we did not assess state changes after that point. We did not distinguish between cohabitation and marriage in the sequences, as nearly half of all children in Finland are born outside marriage, mainly to cohabiting parents. This trend is most pronounced for first children, 57 per cent of whom were born outside marriage in 2015 (Official Statistics of Finland 2016).

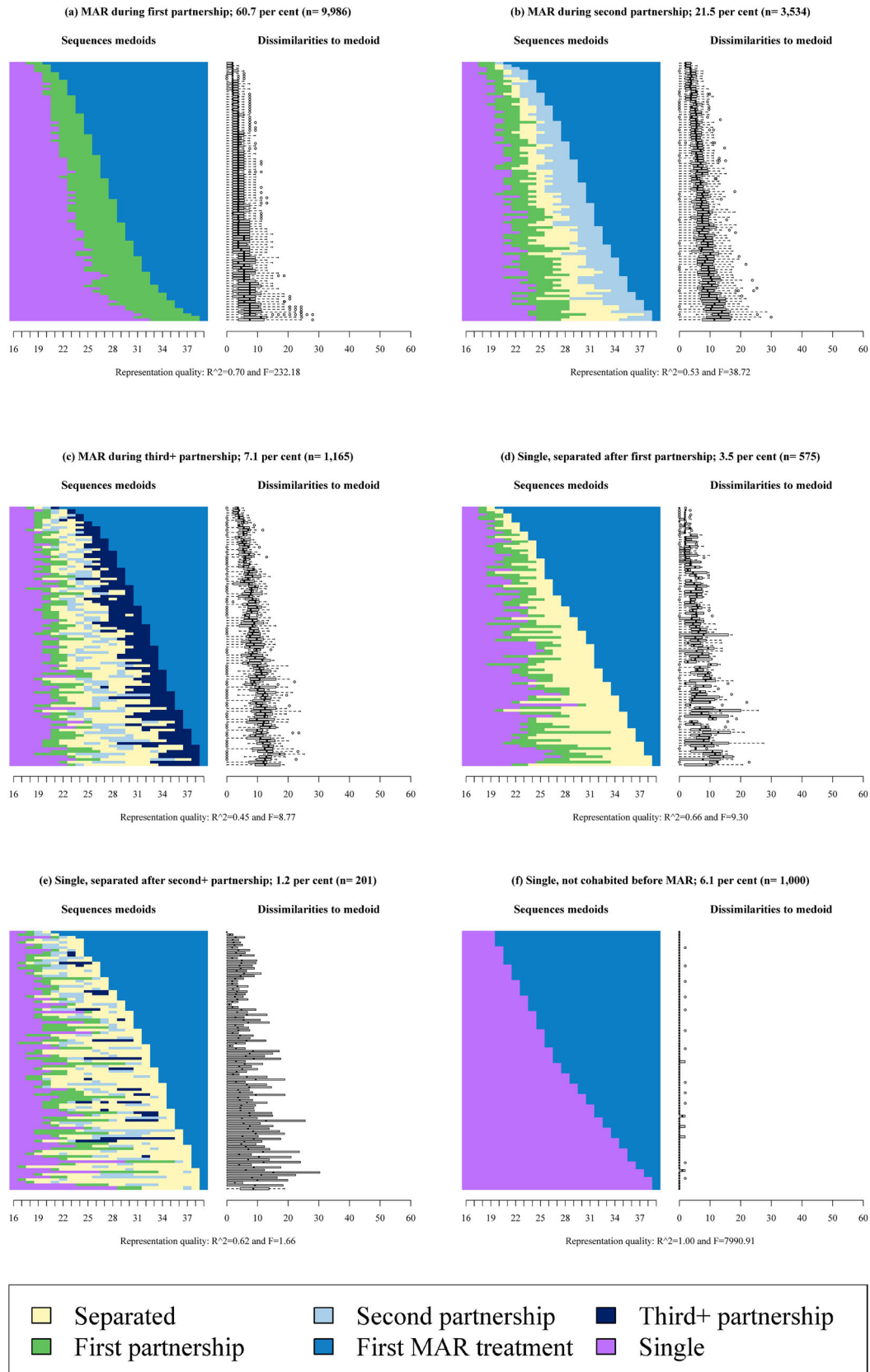
We identified six distinctive groups of partnership trajectories preceding the first MAR treatment by using women's partnership status at the time they had started MAR (whether living with a partner or alone) and the number of previous partnerships they had experienced (if any). We created the pathway groups manually instead of using sequence analysis techniques, in order to capture the exact chronological and sequential order of partnership states up to the moment a woman had started MAR treatment. For the women undergoing MAR in a partnership, we distinguished between those who were in their (a) first, (b) second, or (c) third/higher-order partnership. Among the women starting MAR without a partner, we distinguished between those who were undergoing MAR after separating from (d) a first vs (e) a second/higher-order partner and (f) those who had never cohabited before MAR. As we could not identify same-sex and living-apart-together couples in the cohabitation register, it is possible that some of the women in our sample who had started MAR treatment without a cohabiting partner were in a relationship. Nevertheless, we believe that these couples only represent a small number of cases. Based on the Medical Birth Register, about 1 per cent of women undergoing treatment without a prior partnership may have been in a same-sex couple. We do not expect the proportion of couples living apart together at the start of MAR to be high, as the overall proportion of new parents in this partnership form remains low in Europe (Pasteels *et al.* 2017; Schnor 2015; Kuang *et al.* 2020).

After identifying the six distinctive groups of partnership trajectories preceding MAR, we used RFS plots to investigate heterogeneity within and between

the groups (Fasang and Liao 2014). RFS is a useful technique for plotting individual sequences when group sizes are large and there is a risk of overplotting: that is, when some individual sequences blend in with the more common patterns and become invisible. To create the plots, we sorted the annual sequences by timing of first MAR treatment as the key transition of interest. We divided each of the six pathway groups into 100 similarly sized frequency groups so we could then choose a representative sequence from each group and plot it as a conventional index plot, without running the risk of overplotting. We used the optimal matching technique to measure the distances between the sequences in each frequency group and to define the representative sequence ('medoid'). A medoid is an individual sequence for which the average dissimilarity to all other objects in the group is minimal. We set the insertion and deletion ('indel') costs conventionally using the value '1' and derived the substitution cost from the transition matrix for each time point in our data. We performed sequence analyses using the TraMineR package (version 2.2-1) and the seqplot.rf function in TraMineRextras (version 0.6.0) (Gabadinho *et al.* 2011). The final graphs we present later, in Figure 1, show index plots for 100 medoids in each pathway group on the left-hand side, with a box and whisker plot that describes dissimilarities to the medoid within each frequency group on the right-hand side. The equivalent of the  $R^2$  statistic and the F-test to evaluate the goodness of fit of the chosen RFS representation are presented below each graph. Additional sensitivity analyses (not shown) in which the sequences were sorted by the multidimensional scaling factor, and various substitution costs and distance measures (i.e. Dynamic Hamming Distance) were applied, provided overall higher dissimilarities to the medoid in each group and lower  $R^2$  and F-test parameters; thus we considered them less appropriate for our analysis.

### *Socio-demographic characteristics*

After we identified the six groups of partnership pathways leading to MAR, we investigated whether women's socio-demographic characteristics differed between the groups and, if so, how. Preparing the data in sequential format enabled us to go beyond calculating the mean age at the transitions of interest (i.e. the mean age at the start of the first or higher-order partnership or at the start of MAR) by providing additional data on durations (mean time spent in each state; presented in Table A2, supplementary material). For women who had



**Figure 1** Relative frequency sequence plots of women undergoing first MAR treatment in Finland in 1995–2017, by partnership pathway group

*Notes:* For each of the panels, the graph on the left-hand side shows index plots for 100 medoids in each pathway group, where the x-axis refers to woman’s age (16–40); the graph on the right-hand side shows box and whisker plots that describe dissimilarities to the medoid within each frequency group.

*Source:* Authors’ calculations from Finnish population register data.



started MAR in a partnership, we estimated the mean duration of their current partnership. For women who had started MAR without a partner after at least one previous partnership, we estimated the mean duration of the period between the last separation and first MAR treatment. We used these markers together with the mean age at entry into first partnership (if any), mean age at entry into current partnership (if currently living with a partner), and mean age at start of treatment, to complement the RFS plots in describing and comparing the six identified pathway groups.

We used data from Statistics Finland on education and income to describe the SES profiles of the women undergoing MAR treatment. To measure education, we used the highest level of qualification obtained by the time a woman had started MAR treatment, distinguishing between low (compulsory school education), medium (upper secondary and post-secondary, non-tertiary education), and high (tertiary) levels. For income, we used annual household income deciles derived by Statistics Finland. The deciles were calculated for the total population using households' equivalent disposable money income, which included earnings, entrepreneurial and property income, and current transfers received after taxes and tax-deductible expenses. The deciles ranged from one (lowest income) to 10 (highest income) and were recorded in the calendar year preceding the treatment. The number of cases with missing income data was low ( $n = 34$ ). Although we did not distinguish between cohabitation and marriage in the sequences, we separately report the proportion of women who were married at the start of treatment for women in partnerships. We also looked at the distribution of the partnership pathways preceding MAR among the seven single-year birth cohorts (1971–77) to investigate whether the prevalence changed across cohorts and, if so, how.

In the next section, we first describe the prevalence of different partnership pathways that precede MAR and present RFS plots that illustrate them. We then discuss the heterogeneity between and within pathways, and we complement the RFS plots with information on the timing and duration of first and subsequent unions, as well as on periods spent without a partner and timing of the start of MAR treatment. Next, we explore whether the socio-demographic profiles of women who started MAR differed depending on their partnership pathways—and, if so, how—using information on education, income, and marital status at the start of treatment and on women's birth cohort. We also discuss how the partnership histories and

socio-demographic profile of women undergoing MAR differ from those of first-time mothers from the same birth cohorts who conceived naturally.

## Results

### *Partnership trajectories preceding MAR*

Of all the women in the sample, 89.3 per cent started MAR treatment while living with a partner, whereas just 10.7 per cent were living without a partner (Table 1, panel A). Most women (60.7 per cent) started MAR treatment in their first partnership, followed by women who underwent MAR in a second (21.5 per cent) or higher-order partnership (7.1 per cent). Of the women who started treatment without a partner, nearly half had experienced at least one cohabiting episode. Around 3.5 per cent of the women undergoing MAR did so after separating from their first partner, and another 1.2 per cent did so after separating from a second or a higher-order partner.

The distribution of partnership pathways preceding MAR was very similar to the distribution of partnership pathways into first parenthood among women of the same cohorts who conceived naturally (Table 1, panel B). Women who conceived naturally were, on average, younger compared with women who started MAR. However, the mean age at first partnership was very similar across women in partnerships in both groups, and the differences in mean duration of current partnership before conception and before MAR differed by around one year. This finding suggests general similarities in partnership transitions among the two groups, as couples who start MAR must have tried to conceive naturally for at least 12 months before undergoing MAR. It is harder to draw direct comparisons between single women undergoing MAR and conceiving naturally, as the proportion of unintended pregnancies is likely to be higher among women who conceive naturally without a partner compared with those who conceive in a partnership.

To examine whether there was heterogeneity in women's partnership trajectories preceding MAR, we present RFS plots for each of the six previously defined pathway groups (Figure 1). Table 1 (panel A) and Table A2 (supplementary material) complement the RFS plots by providing numerical information on the timing and mean duration of key partnership states for each of the six pathway groups.

Figure 1 panels (a), (b), and (c) capture the partnership trajectories of women who started MAR

**Table 1** Timing and mean duration of key partnership states preceding first MAR treatment or natural conception of first child by age 40, by partnership pathway group: Finland, women born 1971–77

<b>(A) Women undergoing MAR</b>					
Partnership pathway before MAR					
<i>Women undergoing MAR in a partnership</i>	Prevalence (percentage)	Mean age at first MAR treatment (years), (SD)	Mean age at first partnership (years), (SD)	Mean duration of current partnership before MAR (years), (SD)	Mean age at entry into current partnership before MAR (years), (SD)
(a) MAR during first partnership	60.7	28.9 (4.4)	23.9 (4.1)	5.0 (3.5)	23.9 (4.1)
(b) MAR during second partnership	21.5	31.3 (4.3)	21.8 (2.9)	3.4 (2.7)	27.9 (4.2)
(c) MAR during third+ partnership	7.1	33.1 (4.2)	20.7 (2.3)	2.8 (2.3)	30.3 (4.2)
<i>Women undergoing MAR without a partner</i>	Prevalence (percentage)	Mean age at first MAR treatment (years), (SD)	Mean age at first partnership (years), (SD)	Mean time spent being single after separation and before MAR (years), (SD)	
(d) Separated after first partnership → MAR	3.5	30.9 (5.1)	22.8 (3.5)	5.1 (4.1)	
(e) Separated after 2nd+ partnership → MAR	1.2	32.9 (4.7)	20.9 (2.5)	3.9 (3.6)	
(f) Did not cohabit before MAR	6.1	28.9 (5.8)	N/A	N/A	
<i>All women undergoing MAR</i>	100 per cent (n = 16,461)	29.8 (4.7)	23.1 (3.9)		
<b>(B) Women who conceived their first child naturally</b>					
Partnership pathway before first conception					
<i>Women conceiving in a partnership</i>	Prevalence (percentage)	Mean age at first conception (years), (SD)	Mean age at first partnership (years), (SD)	Mean duration of current partnership before conception (years), (SD)	Mean age at entry into current partnership before conception (years), (SD)
During first partnership	62.1	27.1 (4.0)	23.5 (3.7)	3.6 (3.0)	23.5 (3.7)
During second partnership	19.3	29.1 (4.1)	21.5 (2.7)	2.2 (2.3)	26.9 (4.0)
During third+ partnership	5.6	30.9 (4.0)	20.5 (2.2)	1.7 (1.9)	29.3 (4.0)

(Continued)

Table 1 Continued.

(B) Women who conceived their first child naturally				
<i>Women conceiving outside a partnership</i>	Prevalence (percentage)	Mean age at first conception (years), (SD)	Mean age at first partnership (years), (SD)	Mean time spent being single after separation and before conception (years), (SD)
Separated after first partnership → conception	4.3	28.3 (4.8)	21.7 (3.1)	3.7 (3.2)
Separated after second+ partnership → conception	1.6	31.0 (4.7)	20.7 (2.5)	2.8 (2.7)
Did not cohabit before conception	7.2	25.5 (4.9)	N/A	N/A
<i>All women who conceived their first child naturally</i>	100 per cent (n = 120,145)	27.7 (4.4)	22.8 (3.6)	

Notes: 'N/A' stands for 'not applicable' to the mean age at first partnership and the mean time spent being single after separation among women who did not cohabit before conception or MAR. SD is the standard deviation.

Source: Authors' calculations from Finnish population register data.

treatment in a partnership; Figure 1 panels (d), (e), and (f) capture the partnership trajectories of women who underwent MAR without a partner. On average, the women in the sample started MAR treatment at age 29.8, and those who had experienced at least one cohabiting union entered their first partnership at a mean age of 23.1 (Table 1, panel A). Women who were undergoing MAR with their first partner were, on average, the last to enter their first union (at age 23.9) and the first to start treatment (at age 28.9; Table 1). However, Figure 1(a) highlights substantial heterogeneity in the timing of both first union and start of MAR, with around one-quarter of the women in this group entering their first union either before age 21 or after age 26 (also reflected in the highest standard deviation in the age at first union; Table 1). By contrast, women who started MAR in a third/higher-order partnership, and women who had experienced multiple partnerships but then underwent MAR on their own after a separation, entered their first union relatively early (below age 21) but started treatment much later (at ages 33.1 and 32.9, respectively) (Table 1). Indeed, most of the women with multiple partnerships had entered their first union by their early 20s, and nearly all had done so by age 26. Women who started MAR in a third/higher-order partnership had, on average, entered their current partnership 2.4 years later than women who started MAR in a second partnership (at ages 30.3 and 27.9, respectively). These women had also experienced, on average, a shorter period of living together before starting MAR treatment (2.8 and 3.4 years, respectively) than women who were undergoing MAR with their first partner (5.0 years). In addition, Figure 1(c) highlights the heterogeneity in partnership trajectories within the group of partnered women with more than two partnership episodes before starting MAR treatment; this group had spent substantial periods of time being single between partnerships (time spent in a 'separated' state shown in Table A2, supplementary material). The heterogeneity in the timing of treatment within this group is reflected in the relatively high proportions of women starting treatment between ages 30 and 35 as well as aged over 35 (around 40 per cent for each), compared with 11 and 23 per cent of women who started MAR aged over 35 in first and second partnerships, respectively (Table A3, supplementary material).

Figures 1(d) and (e) show the partnership trajectories of women who underwent MAR on their own after separating from a partner. Women who underwent MAR after separating from their first partner

(Figure 1(d)) had entered their first partnership later, on average, than women who underwent MAR after separating from a second or higher-order partner (Figure 1(e)), but the former group had spent longer periods of time both in their first partnership (3.0 vs 2.2 years; Table A2, supplementary material) and being single before undergoing MAR (5.1 vs 3.9 years; Table 1, panel A). In terms of the timing of MAR, 72.5 per cent of women who underwent MAR after separating from their first partner started treatment by age 35 compared with less than 60 per cent among those who had experienced multiple partnerships, highlighting the heterogeneity within both groups (Table A3, supplementary material).

Figure 1(f) presents the partnership trajectories of women who were undergoing MAR without prior partnership experience. At first glance, this group might seem homogeneous, as these women have experienced only two states: that is, being single and undergoing MAR while single. However, the figure highlights substantial heterogeneity among these women in the timing of the treatment (reflected in the highest standard deviation in age at MAR; Table 1). Although the mean age at start of MAR in this group was lower compared with women who underwent MAR on their own after separating from a partner, if we look at the proportions of women who started treatment by ages 25, 30, 35, and over 35, the timing of treatment was almost evenly distributed by age (Table A3, supplementary material).

### Socio-demographic characteristics of women undergoing MAR

Compared with women in the 1971–77 birth cohorts who conceived their first child naturally, women who started MAR were, on average, better educated (61.3 vs 52.8 per cent;  $p < 0.001$ ) and had higher incomes (7.5th vs 6.5th income decile,  $p < 0.001$ ; Table 2 cf. Table A4, supplementary material). There was, however, some variation between the six pathway groups. Women who had not cohabited before starting treatment were the least likely to be tertiary educated (52.7 per cent), which may be partially because they had started MAR earlier than the women in the other groups. The variation among the other groups was marginal. We additionally performed a multinomial logistic regression (not shown) to compute the predicted probabilities of belonging to a certain pathway group by education. The results were nearly identical to those presented in Table 2 and Table A5 (supplementary material): the share of women with low education was slightly higher among the women starting MAR in a third/higher-order partnership or without a partner; however, these findings should be interpreted with caution due to the small sample sizes of these groups.

In terms of income, there were some differences between women who started MAR in a partnership vs without a partner (Table 2), resembling the differences among women who conceived naturally in a

**Table 2** Socio-economic profile of women undergoing MAR treatment, by partnership pathway group: Finland, women born 1971–77

Partnership pathway before MAR	Education			Income Mean income decile (SD)	Marital status Percentage married at the start of MAR
	Low educated (percentage)	Medium educated (percentage)	Highly educated (percentage)		
(a) MAR during first partnership	4.6	33.3	62.1	7.5 (2.5)	62.2
(b) MAR during second partnership	5.0	32.1	62.9	8.0 (2.3)	47.0
(c) MAR during third+ partnership	5.6	35.8	58.6	7.9 (2.3)	33.7
(d) Separated after first partnership → MAR	6.6	33.7	57.2	6.0 (3.0)	N/A
(e) Separated after second+ partnership → MAR	6.0	36.8	59.7	6.2 (2.9)	N/A
(f) Did not cohabit before MAR	5.4	41.9	52.7	5.9 (2.9)	N/A
All	4.9	33.8	61.3	7.5 (2.6)	56.2

Notes: 'N/A' stands for 'not applicable' to the marital status of women who underwent MAR without a partner. SD is the standard deviation. Source: Authors' calculations from Finnish population register data.

partnership vs without a partner (Table A4, supplementary material). Women who started MAR in a partnership, on average, belonged to the higher income deciles—from 7.5 to 8.0 (7.7 on average)—whereas incomes for those who started MAR without a partner varied between 5.9 and 6.2 (6.0 on average,  $p < 0.001$ ; Table 2). With regard to marital status, among women who started MAR with their first partner, 62.2 per cent were married at the start of the treatment compared with lower proportions of those undergoing MAR with their second (47.0 per cent) or third and higher-order partner (33.7 per cent). Overall, the proportion of women married before the start of MAR treatment was higher than the proportion married among those who conceived naturally (56.2 vs 41.5 per cent,  $p < 0.001$ ).

Finally, we looked at how the prevalence of the six partnership pathway groups preceding MAR had changed across single-year birth cohorts (Table 3). Overall, starting MAR with the first partner remained the most common pathway across all cohorts. However, the proportion of women who followed this trajectory decreased gradually from 62.9 per cent for the 1971 cohort to 58.2 per cent for the 1977 cohort. Conversely, the proportion of women who started MAR in their second partnership and the proportion of unpartnered women who started MAR after separating from their second or higher-order partner increased across the cohorts. The rest of the changes were marginal. Additionally, we analysed changes in women's SES profile across cohorts. Contrary to our expectations, there was almost no change in mean income or proportion of highly educated among women undergoing MAR across the cohorts.

## Discussion

As life-course trajectories are becoming increasingly complex, and childbearing is being postponed until later in life (Billari *et al.* 2006; Billari and Liefbroer 2010), the partnership pathways that lead to first parenthood have become more heterogeneous (Jalovaara and Fasang 2015; Mikolai 2017; Guzzo and Hayford 2020). An increasing proportion of women are undergoing MAR treatment to conceive their first child; however, little is known about the partnership pathways and demographics of this growing subgroup of the population. In this paper, we sought to fill this gap in the literature by using rich longitudinal data from population registers to provide a detailed description of six typical partnership pathways preceding MAR among seven cohorts of nulliparous women in Finland. We also investigated whether the socio-demographic characteristics of the women in these pathway groups differed and had changed across the cohorts.

Our findings can be summarized in three points. First, we observed substantial heterogeneity both in women's partnership status at the time they began the treatment and in their longitudinal partnership histories before they started MAR. Most women were living with a partner (89.3 per cent) when they started treatment. The majority of women (60.7 per cent) underwent MAR with their first partner after, on average, five years of living together; followed by women who underwent MAR in a second (21.5 per cent) or higher-order partnership (7.1 per cent). However, a non-negligible share of women (10.7 per cent) underwent MAR without a partner. Out of these women, nearly half had experienced at least one partnership episode, and these women were, on average, single

**Table 3** Prevalence of partnership pathways preceding MAR (percentages) and mean income and proportion of highly educated women: women undergoing MAR treatment in Finland, by birth cohort

Partnership pathway before MAR	Birth cohort						
	1971	1972	1973	1974	1975	1976	1977
(a) MAR during first partnership	62.9	63.8	62.1	60.3	59.7	58.5	58.2
(b) MAR during second partnership	20.1	18.9	20.0	22.0	22.0	23.1	23.4
(c) MAR during third+ partnership	7.0	7.7	7.3	6.1	7.1	7.0	7.4
(d) Separated after first partnership → MAR	3.6	3.5	3.8	3.2	3.8	3.6	3.1
(e) Separated after second+ partnership → MAR	1.2	0.9	1.1	1.1	0.8	1.4	1.9
(f) Did not cohabit before MAR	5.2	5.2	5.7	7.3	6.6	6.3	6.0
All	100	100	100	100	100	100	100
Mean income decile (SD)	7.5 (2.6)	7.5 (2.6)	7.5 (2.6)	7.5 (2.6)	7.4 (2.6)	7.6 (2.6)	7.6 (2.5)
Percentage of women highly educated	61.0	60.5	61.2	61.8	58.9	62.0	63.9

Note: SD is the standard deviation.

Source: Authors' calculations from Finnish population register data.

for 4.5 years before they started treatment. Second, we observed heterogeneity in the timing of treatment both between and within the groups. Third, compared with the general population, the women who started MAR were more likely to be highly educated (61.3 per cent) and to have higher incomes (7.5th income decile). Nevertheless, the women who started MAR in a partnership were slightly more advantaged in terms of SES characteristics than the women who underwent MAR alone.

The six partnership pathways leading to MAR that we identified in this paper resembled the partnership pathways preceding first parenthood among women in Finland who conceived naturally, with an overall high proportion of women who underwent MAR or conceived naturally being in their first partnership (60.7 per cent and 62.1 per cent, respectively), highlighting that the majority of women in these birth cohorts resorted to MAR to conceive their first child in a first partnership. However, the results also revealed an increasing complexity of partnership behaviours across cohorts among women who started MAR, as they showed a gradual decline in the proportion of women who underwent MAR in a first union and small increases in the shares of women who underwent MAR in a higher-order partnership or while single. This pattern can be at least partially attributed to the increasing proportion of first unions that have ended in separation among the most recent cohorts and the expansion of access to MAR treatment for women without a partner. Our findings also highlighted the heterogeneity in the timing of first union formation and timing of start of MAR treatment between and within groups. For example, compared with all other groups, the women who underwent MAR in a first union were, on average, the oldest at first union formation and the youngest at the start of MAR. It may be the case that women in such unions had spent longer searching for a suitable partner or had higher fertility intentions from young adulthood (Schoen et al. 1999; Morgan and Rackin 2010; Nitsche and Hayford 2020). We also observed that over 60 per cent of the women in this group were married (rather than cohabiting) before undergoing MAR, which could indicate potentially stronger commitments and family orientation among these women. However, nearly one-quarter of the women in this group had already entered their first union by their early 20s and had started MAR a few years later. By contrast, the majority of women who had experienced one or more union dissolutions before undergoing MAR had already entered their first partnership by their early 20s but were on

average the oldest among the groups when they started MAR. This could be because the women in this group (or their partners) did not start planning to have a family until later in life. However, as we did not have information on the women's fertility intentions or the length of their infertility, it is hard to speculate about whether their fertility intentions changed over time or whether their decision to undergo MAR was related to previous experiences of subfertility or to declining fecundity over time.

Despite the heterogeneity in timing of MAR driven by partnership pathways preceding MAR, our findings highlighted a relatively young age profile of women seeking MAR to conceive: that is, the average age at the start of MAR was 29.8, and just over half of the women started treatment before age 30. In comparison, the mean age at first birth among women who conceived naturally in Finland was 28.5 among the cohorts born in 1971–77. This finding contradicts the common perception that MAR treatment is used mainly by women who are trying to conceive at older ages. This perception is likely based on the fact that MAR parents are, on average, older than parents who conceive naturally (Goisis et al. 2019, 2020; Barbuscia et al. 2020; Pelikh, Smith et al. 2022). Yet our findings suggested that the older age profile of women who conceived through MAR could be related to how long it took them to conceive rather than the tendency to start treatment at older ages.

Echoing the increase in the independence of women associated with the gender revolution, we found that nearly 11 per cent of the women in our sample did not have a partner when they started MAR treatment and that the proportion of single women was higher among the more recent cohorts. On the one hand, there was a slight increase in the proportion of women who underwent MAR treatment after a separation, which reflects the complex dynamics of partnership trajectories and the increase in separation rates. On the other hand, the rising proportion of women who underwent MAR without a prior partnership history could be in line with the already-observed increase in the number of people who have never been in a partnership (Bellani et al. 2017; Jalovaara and Fasang 2017). Although an investigation of future partnership trajectories would go beyond the focus of this paper, we would expect at least some of these women to remain single after giving birth, and this group may thus represent a new family form: single-parent households led by highly educated mothers who have not experienced a family break-up. This is an atypical profile, as, on average, single mothers tend to be disadvantaged,

which has well-established implications for their children's well-being and life-course trajectories (McLanahan 2004; Waldfogel *et al.* 2010). By contrast, there is evidence that growing up in a single-parent family with a mother who underwent MAR is not negatively associated with a child's psychological well-being or with the quality of the child-parent relationship (Golombok *et al.* 1997; Golombok and Badger 2010). However, as these studies were based on small samples, there is a need for additional research into how these associations might develop over time and across different contexts.

Previous research has shown that the uptake of MAR is often linked to affordability and the sources of funding for treatment, as well as regulatory environments and socio-cultural norms (Chambers *et al.* 2009; Passet-Wittig and Greil 2021). Our findings suggested that women in Finland who started MAR tended to be highly educated with above-average incomes and that these characteristics varied only slightly between the different partnership pathways and across cohorts. These results are in line with recent evidence obtained on the selective SES profile of women undergoing MAR in contexts with different welfare systems (Bitler and Schmidt 2012; Goisis *et al.* 2020; Alon and Pinilla 2021; Köppen *et al.* 2021). On the one hand, because MAR treatment is highly subsidized in Finland, we would expect to observe high uptake of MAR services across a wide range of SES groups (Klemetti *et al.* 2004). On the other hand, there may still be barriers to accessing MAR, as treatment can be costly and thus unaffordable for women with fewer resources (an argument that has also been called 'stratified reproduction'). Other barriers might exist at the clinic level, for example unequal provision of services to certain subgroups of the population, including single women (Bell 2009, 2010). Moreover, the higher use of MAR among women with more advantaged characteristics might also be related to higher demand, as more advantaged women tend to be older when they start trying to get pregnant, regardless of their partnership history or current partnership status.

To our knowledge, this is the first large-scale study to look at women's partnership trajectories before they started MAR treatment. To date, population-level studies of people who undergoing MAR have been rare due to a lack of high-quality representative data related to the use of MAR and to the challenges of linking these data with information on the longitudinal life-course trajectories of these individuals before they started the treatment.

The strengths of our study included the use of large-scale, high-quality population register data to

investigate the partnership trajectories of women who underwent MAR. These data cover the whole population and are not affected by the non-response and recall bias issues associated with survey data. We combined all available data sources to comprehensively identify nearly all women in the Finnish population who had undergone MAR treatment and to determine with a high degree of accuracy when they started the treatment.

Our study had some limitations. First, we likely missed a proportion of the women who underwent MAR—those who only underwent ovulation induction without intrauterine insemination—as some ovulation induction drugs were no longer reimbursed after 2000 and the loss of this information could be only partially compensated with data from the Care Register for Health Care and Medical Birth Registers. However, the number of such cases is likely small because most of these drugs are used in combination with other fertility drugs, which are included in the register. In addition, we did not have access to data from private clinics, and this might have led to an underestimation of the number of women undergoing MAR. For example, single women might have turned to private treatment providers if they considered the queue for donor sperm in the public sector to be too long. This may also have been the case for financially advantaged couples who were not willing to wait for treatment in the public sector (Alon and Pinilla 2021). However, as all MAR treatments involve the use of drugs (Klemetti *et al.* 2007) and the Finnish Prescription Register data allowed us to identify women who were undergoing treatment in both the public and private sectors (as a proportion of the cost in the private sector is covered by national insurance), it is unlikely that these limitations seriously biased our results. Second, we could not reliably identify the types of treatments used or the causes of infertility. Distinguishing between treatment types could shed light on further differences between the trajectories, as more intensive treatments (ART) could be associated with longer periods of infertility before seeking MAR, which may, in turn, have affected the partnership histories that preceded the treatment (Kjaer *et al.* 2014; Ferreira *et al.* 2016). Moreover, as some drugs used for MAR treatment (e.g. dydrogesterone) can also be used in adolescents and young women for specific hormonal treatments other than MAR, there was some chance of misidentifying these treatments as MAR among women starting MAR in their early 20s. However, as the proportions and absolute numbers of those cases are low, it is

unlikely to have affected the overall findings from the paper. Third, we could not identify same-sex couples in the cohabitation register. As more and more countries include same-sex couples in legislation that regulates access to MAR treatment, more data are needed to investigate the demographic and SES profiles and the life-course trajectories of the couples in this subgroup. Fourth, we excluded women who started treatment after age 40, since doing so would have disproportionately represented partnership sequences for the earliest cohorts (who had reached aged 40+ in 2017, our last data observation). However, only a small fraction of women start MAR treatment beyond age 40 and therefore their inclusion would not have resulted in qualitatively different outcomes.

Studying partnership trajectories preceding MAR could have wider implications with regard to future family well-being in couples and among single women undergoing MAR. There is growing evidence that experiences of undergoing MAR treatment may influence individuals' and couples' well-being and future partnerships (Schmidt et al. 2005; Verhaak et al. 2005; Martins et al. 2018; Tosi and Goisis 2021). At the same time, psychological distress, partnership status, and partnership quality could affect treatment success or discontinuation (Olivius et al. 2004; Boivin and Schmidt 2005; Walschaerts et al. 2013). Future research should explore whether partnership trajectories into MAR influence future partnership stability depending on the outcomes of treatment and, if so, how. Moreover, despite the wider availability of treatments and a rising proportion of women undergoing MAR without a partner, we know very little about family well-being and child outcomes of the new family form of single-parent households led by highly educated mothers who have not experienced a family break-up.

In conclusion, in line with the expectation from the SDT, we observed heterogeneous partnership pathways preceding MAR treatment, including a rising proportion of women undergoing MAR in a higher-order partnership or without a partner. Our findings indicated that the increasing complexity of partnership pathways among women who conceive naturally does translate to those who use MAR to conceive. Contrary to our expectations, we did not find changes in the SES profile across cohorts, as women who started MAR had a select profile regardless of their partnership status or history, with the majority being highly educated and having more financial resources compared with women who conceived naturally. With the continuing postponement of transition to first parenthood, we

might expect the demand for MAR services and their contribution to total fertility and to the changing profile of first-time mothers to increase in future (Faddy et al. 2018; Raymer et al. 2020). Reproductive technologies could have an even bigger impact on life-course trajectories in future, altering the societal 'deadlines' and norms for parenthood (Billari et al. 2011).

## Notes and acknowledgements

- 1 Alina Pelikh and Alice Goisis are based at the Centre for Longitudinal Studies, Social Research Institute, University College London, UK. Hanna Remes and Niina Metsä-Simola are based in the Population Research Unit, University of Helsinki, Finland.
- 2 Please direct all correspondence to Alina Pelikh, Centre for Longitudinal Studies, Social Research Institute, University College London, 55–59 Gordon Square, London WC1E 6BT, UK; or by email: a.pelikh@ucl.ac.uk
- 3 Funding: This work was supported by European Research Council agreement number 803958 (to Alice Goisis).
- 4 An early version of this article was presented at the British Society for Population Studies annual conference held virtually, 14–15 September 2021.
- 5 The authors are grateful to the three anonymous referees and the editor for their valuable comments and suggestions on a previous version of this paper.

## Disclosure statement

No potential conflict of interest was reported by the authors.

## ORCID

Alina Pelikh  <http://orcid.org/0000-0002-1359-1749>

Hanna Remes  <http://orcid.org/0000-0002-9291-703X>

Niina Metsä-Simola  <http://orcid.org/0000-0001-8813-3980>

Alice Goisis  <http://orcid.org/0000-0002-3038-0337>

## References

- Abbott, A., and A. Tsay. 2000. Sequence analysis and optimal matching methods in sociology: Review and prospect, *Sociological Methods and Research* 29(1): 3–33. <https://doi.org/10.1177/0049124100029001001>



- Alon, I., and J. Pinilla. 2021. Assisted reproduction in Spain, outcome and socio-economic determinants of access, *International Journal for Equity in Health* 20: 156. <https://doi.org/10.1186/s12939-021-01438-x>
- Baizán, P., A. Aassve, and F. C. Billari. 2003. Cohabitation, marriage, and first birth: The interrelationship of family formation events in Spain, *European Journal of Population/Revue Européenne de Démographie* 19(2): 147–169. <https://doi.org/10.1023/A:1023343001627>
- Barbuscia, A., P. Martikainen, M. Myrskylä, H. Remes, E. Somigliana, R. Klemetti, and A. Goisis. 2020. Maternal age and risk of low birth weight and premature birth in children conceived through medically assisted reproduction. Evidence from Finnish population registers, *Human Reproduction* 35(1): 212–220. <https://doi.org/10.1093/humrep/dez275>
- Beaujouan, É. 2022. Late fertility intentions increase over time in Austria, but chances to have a child at later ages remain low, *Reproductive Biomedicine & Society Online* 14: 125–139. <https://doi.org/10.1016/j.rbms.2021.10.002>
- Beaujouan, É., A. Reimondos, E. Gray, A. Evans, and T. Sobotka. 2019. Declining realisation of reproductive intentions with age, *Human Reproduction* 34(10): 1906–1914. <https://doi.org/10.1093/humrep/dez150>
- Beaujouan, E., and A. Solaz. 2013. Racing against the biological clock? Childbearing and sterility among men and women in second unions in France, *European Journal of Population/Revue Européenne de Démographie* 29(1): 39–67. <https://doi.org/10.1007/s10680-012-9271-4>
- Bell, A. V. 2009. “It’s way out of my league”: Low-income women’s experiences of medicalized infertility, *Gender and Society* 23(5): 688–709. <https://doi.org/10.1177/0891243209343708>
- Bell, A. V. 2010. Beyond (financial) accessibility: Inequalities within the medicalisation of infertility, *Sociology of Health and Illness* 32(4): 631–646. <https://doi.org/10.1111/j.1467-9566.2009.01235.x>
- Bellani, D., G. Esping-Andersen, and L. Nedoluzhko. 2017. Never partnered: A multilevel analysis of lifelong singlehood, *Demographic Research* 37: 53–100. <https://doi.org/10.4054/DemRes.2017.37.4>
- Berrington, A. 2017. Childlessness in the UK, in M. Kreyenfeld and D. Konietzka (eds), *Childlessness in Europe: Contexts, Causes, and Consequences*. Cham: Springer, pp. 57–76.
- Billari, F. C., and A. C. Liefbroer. 2010. Towards a new pattern of transition to adulthood?, *Advances in Life Course Research* 15(2–3): 59–75. <https://doi.org/10.1016/j.alcr.2010.10.003>
- Billari, F. C., A. C. Liefbroer, and D. Philipov. 2006. The postponement of childbearing in Europe: Driving forces and implications, *Vienna Yearbook of Population Research* 2006(4): 1–17. <https://www.jstor.org/stable/23025475>
- Billari, F. C., A. Goisis, A. C. Liefbroer, R. A. Settersten, A. Aassve, G. Hagestad, and Z. Spéder. 2011. Social age deadlines for the childbearing of women and men, *Human Reproduction* 26(3): 616–622. <https://doi.org/10.1093/humrep/deq360>
- Bitler, M. P., and L. Schmidt. 2012. Utilization of infertility treatments: The effects of insurance mandates, *Demography* 49(1): 125–149. <https://doi.org/10.1007/s13524-011-0078-4>
- Boivin, J., and L. Schmidt. 2005. Infertility-related stress in men and women predicts treatment outcome 1 year later, *Fertility and Sterility* 83(6): 1745–1752. <https://doi.org/10.1016/j.fertnstert.2004.12.039>
- Buber, I., and A. Prskawetz. 2000. Fertility in second unions in Austria: Findings from the Austrian FFS, *Demographic Research* 3(2), <https://doi.org/10.4054/DemRes.2000.3.2>
- Chachamovich, J. R., E. Chachamovich, H. Ezer, M. P. Fleck, D. Knauth, and E. P. Passos. 2010. Investigating quality of life and health-related quality of life in infertility: A systematic review, *Journal of Psychosomatic Obstetrics and Gynecology* 31(2): 101–110. <https://doi.org/10.3109/0167482X.2010.481337>
- Chambers, G. M., E. A. Sullivan, O. Ishihara, M. G. Chapman, and G. D. Adamson. 2009. The economic impact of assisted reproductive technology: A review of selected developed countries, *Fertility and Sterility* 91(6): 2281–2294. <https://doi.org/10.1016/j.fertnstert.2009.04.029>
- Cherlin, A. J. 2004. The deinstitutionalization of American marriage, *Journal of Marriage and Family* 66(4): 848–861. <https://doi.org/10.1111/j.0022-2445.2004.00058.x>
- Cohen, J., and W. Manning. 2010. The relationship context of premarital serial cohabitation, *Social Science Research* 39(5): 766–776. <https://doi.org/10.1016/j.ssresearch.2010.04.011>
- Conger, R. D., K. J. Conger, and M. J. Martin. 2010. Socio-economic status, family processes, and individual development, *Journal of Marriage and Family* 72(3): 685–704. <https://doi.org/10.1111/j.1741-3737.2010.00725.x>
- Dyer, S. J., N. Abrahams, M. Hoffman, and Z. M. van der Spuy. 2002. ‘Men leave me as I cannot have children’: Women’s experiences with involuntary childlessness, *Human Reproduction* 17(6): 1663–1668. <https://doi.org/10.1093/humrep/17.6.1663>
- Eickmeyer, K. J., and W. D. Manning. 2018. Serial cohabitation in young adulthood: Baby boomers to millennials, *Journal of Marriage and Family* 80(4): 826–840. <https://doi.org/10.1111/jomf.12495>

- Ellwood, D. T., and C. Jencks. 2004. The spread of single-parent families in the United States since 1960. Working Paper Series rwp04-008, Harvard University, John F. Kennedy School of Government.
- ESHRE Capri Workshop Group. 2005. Fertility and ageing, *Human Reproduction Update* 11(3): 261–276. <https://doi.org/10.1093/humupd/dmi006>
- European Society of Human Reproduction and Embryology (ESHRE). 2022. ART fact sheet. Retrieved from <https://www.eshre.eu/Press-Room/Resources>.
- Faddy, M. J., M. D. Gosden, and R. G. Gosden. 2018. A demographic projection of the contribution of assisted reproductive technologies to world population growth, *Reproductive Biomedicine Online* 36(4): 455–458. <https://doi.org/10.1016/j.rbmo.2018.01.006>
- Fasang, A. E., and T. F. Liao. 2014. Visualizing sequences in the social sciences: Relative frequency sequence plots, *Sociological Methods and Research* 43(4): 643–676. <https://doi.org/10.1177/0049124113506563>
- Ferreira, M., E. T. Sanchez, N. Gatimel, C. Fajau, F. Lesourd, L. Bujan, R. Mieusset et al. 2016. Parenthood and separation in couples 6 years after their first infertility consultation, *European Journal of Obstetrics and Gynecology and Reproductive Biology* 198: 7–11. <https://doi.org/10.1016/j.ejogrb.2015.12.027>
- Gabadinho, A., G. Ritschard, N. Müller, and M. Studer. 2011. Analyzing and visualizing state sequences in R with TraMineR, *Journal of Statistical Software* 40(4): 1–37. <https://doi.org/10.18637/jss.v040.i04>
- Goisis, A., H. Remes, P. Martikainen, R. Klemetti, and M. Myrskylä. 2019. Medically assisted reproduction and birth outcomes: A within-family analysis using Finnish population registers, *The Lancet* 393(10177): 1225–1232. [https://doi.org/10.1016/S0140-6736\(18\)31863-4](https://doi.org/10.1016/S0140-6736(18)31863-4)
- Goisis, A., S. E. Håberg, H. I. Hanevik, M. C. Magnus, and Ø Kravdal. 2020. The demographics of assisted reproductive technology births in a Nordic country, *Human Reproduction* 35(6): 1441–1450. <https://doi.org/10.1093/humrep/deaa055>
- Goldscheider, F., E. Bernhardt, and T. Lappegård. 2015. The gender revolution: A framework for understanding changing family and demographic behavior, *Population and Development Review* 41(2): 207–239. <https://doi.org/10.1111/j.1728-4457.2015.00045.x>
- Golombok, S., and S. Badger. 2010. Children raised in mother-headed families from infancy: A follow-up of children of lesbian and single heterosexual mothers, at early adulthood, *Human Reproduction* 25(1): 150–157. <https://doi.org/10.1093/humrep/dep345>
- Golombok, S., F. Tasker, and C. Murray. 1997. Children raised in fatherless families from infancy: Family relationships and the socioemotional development of children of lesbian and single heterosexual mothers, *Journal of Child Psychology and Psychiatry* 38(7): 783–791. <https://doi.org/10.1111/j.1469-7610.1997.tb01596.x>
- Graham, S., and A. Braverman. 2012. ARTs and the single parent, in M. Richards, G. Pennings and J. B. Appleby (eds), *Reproductive Donation: Practice, Policy and Bioethics*. Cambridge: Cambridge University Press, pp. 189–210. <https://doi.org/10.1017/CBO9781139026390.011>.
- Guzzo, K. B. 2014. Trends in cohabitation outcomes: Compositional changes and engagement among never-married young adults, *Journal of Marriage and Family* 76(4): 826–842. <https://doi.org/10.1111/jomf.12123>
- Guzzo, K. B. 2017. Shifts in higher-order unions and step-families among currently cohabiting and married women of childbearing age, *Journal of Family Issues* 38(12): 1775–1799. <https://doi.org/10.1177/0192513X16664180>
- Guzzo, K. B., and S. R. Hayford. 2020. Pathways to parenthood in social and family contexts: Decade in review, 2020, *Journal of Marriage and Family* 82(1): 117–144. <https://doi.org/10.1111/jomf.12618>
- Harkness, S., P. Gregg, and M. Fernández-Salgado. 2020. The rise in single-mother families and children's cognitive development: Evidence from three British birth cohorts, *Child Development* 91(5): 1762–1785. <https://doi.org/10.1111/cdev.13342>
- Hart, R. K. 2019. Union histories of dissolution: What can they say about childlessness?, *European Journal of Population/Revue Européenne de Démographie* 35(1): 101–131. <https://doi.org/10.1007/s10680-018-9464-6>
- Hayford, S. R. 2009. The evolution of fertility expectations over the life course, *Demography* 46(4): 765–783. <https://doi.org/10.1353/dem.0.0073>
- Hellstrand, J., J. Nisén, and M. Myrskylä. 2020. All-time low period fertility in Finland: Demographic drivers, tempo effects, and cohort implications, *Population Studies* 74(3): 315–329. <https://doi.org/10.1080/00324728.2020.1750677>
- Hemminki, E., R. Klemetti, M. Rinta-Paavola, and J. Martikainen. 2003. Identifying exposures of in vitro fertilization from drug reimbursement files: A case study from Finland, *Medical Informatics and the Internet in Medicine* 28(4): 279–289. <https://doi.org/10.1080/14639230310001621666>
- Heuveline, P., and J. M. Timberlake. 2004. The role of cohabitation in family formation: The United States in comparative perspective, *Journal of Marriage and Family* 66(5): 1214–1230. <http://www.jstor.org/stable/3600335>
- Iacovou, M., and L. P. Tavares. 2011. Yearning, learning, and conceding: Reasons men and women change their childbearing intentions, *Population and Development*

- Review* 37(1): 89–123. <https://doi.org/10.1111/j.1728-4457.2011.00391.x>
- Ivanova, K., M. Kalmijn, and W. Uunk. 2014. Fertility after repartnering in The Netherlands: Parenthood or commitment?, *Advances in Life Course Research* 21: 101–112. <https://doi.org/10.1016/j.alcr.2013.08.003>
- Jadva, V., S. Badger, M. Morrissette, and S. Golombok. 2009. ‘Mom by choice, single by life’s circumstance ...’ Findings from a large scale survey of the experiences of single mothers by choice, *Human Fertility* 12(4): 175–184. <https://doi.org/10.3109/14647270903373867>
- Jalovaara, M. 2013. Socioeconomic resources and the dissolution of cohabitations and marriages, *European Journal of Population/Revue Européenne de Démographie* 29(2): 167–193. <https://doi.org/10.1007/s10680-012-9280-3>
- Jalovaara, M., and A. F. Fasang. 2015. Are there gender differences in family trajectories by education in Finland?, *Demographic Research* 33(44): 1241–1256. <https://doi.org/10.4054/DemRes.2015.33.44>
- Jalovaara, M., and A. F. Fasang. 2017. From never partnered to serial cohabitators: Union trajectories to childlessness, *Demographic Research* 36(55): 1703–1720. <https://doi.org/10.4054/DemRes.2017.36.55>
- Kiernan, K. 2001. The rise of cohabitation and childbearing outside marriage in Western Europe, *International Journal of Law, Policy and the Family* 15(1): 1–21. <https://doi.org/10.1093/lawfam/15.1.1>
- Kjaer, T., V. Albieri, A. Jensen, S. K. Kjaer, C. Johansen, and S. O. Dalton. 2014. Divorce or end of cohabitation among Danish women evaluated for fertility problems, *Acta Obstetricia et Gynecologica Scandinavica* 93(3): 269–276. <https://doi.org/10.1111/aogs.12317>
- Klemetti, R., M. Gissler, and E. Hemminki. 2004. Equity in the use of IVF in Finland in the late 1990s, *Scandinavian Journal of Public Health* 32(3): 203–209. <https://doi.org/10.1080/14034940310018444>
- Klemetti, R., M. Gissler, T. Sevón, and E. Hemminki. 2007. Resource allocation of in vitro fertilization: A nationwide register-based cohort study, *BMC Health Services Research* 7(1): 1–8. <https://doi.org/10.1186/1472-6963-7-210>
- Köppen, K., H. Trappe, and C. Schmitt. 2021. Who can take advantage of medically assisted reproduction in Germany?, *Reproductive Biomedicine & Society Online* 13: 51–61. <https://doi.org/10.1016/j.rbms.2021.05.002>
- Kuang, B., A. Berrington, S. Vasireddy, and H. Kulu. 2020. Twenty years of having babies across different countries of the UK: How has parents’ partnership status changed? Centre for Population Change Policy Briefing 56. Retrieved from [http://www.cpc.ac.uk/docs/2020\\_PB56\\_Twenty\\_years\\_of\\_having\\_babies\\_in\\_the\\_UK.pdf](http://www.cpc.ac.uk/docs/2020_PB56_Twenty_years_of_having_babies_in_the_UK.pdf).
- Kuhnt, A.-K., L. Minkus, and P. Buhr. 2021. Uncertainty in fertility intentions from a life course perspective: Which life course markers matter?, *Journal of Family Research* 33(1): 186–210. <https://doi.org/10.20377/jfr-426>
- Lamidi, E. O., W. D. Manning, and S. L. Brown. 2019. Change in the stability of first premarital cohabitation among women in the United States, 1983–2013, *Demography* 56(2): 427–450. <https://doi.org/10.1007/s13524-019-00765-7>
- Lesthaeghe, R., and D. J. Van de Kaa. 1986. *Twee Demografische Transitie* [Second Demographic Transition]. Bevolking: groei en krimp. 9–24.
- Lichter, D. T., R. N. Turner, and S. Sassler. 2010. National estimates of the rise in serial cohabitation, *Social Science Research* 39(5): 754–765. <https://doi.org/10.1016/j.ssresearch.2009.11.002>
- Liefbroer, A. C. 1999. From youth to adulthood: Understanding changing patterns of family formation from a life course perspective, in L. Van Wissen and P. Dykstra (eds), *Population Issues*. New York: Kluwer Academic & Plenum Publishers, pp. 53–85.
- Luk, B. H.-K., and A. Y. Loke. 2015. The impact of infertility on the psychological wellbeing, marital relationships, sexual relationships, and quality of life of couples: A systematic review, *Journal of Sex and Marital Therapy* 41(6): 610–625. <https://doi.org/10.1080/0092623X.2014.958789>
- Macmillan, R. 2005. The structure of the life course: Classic issues and current controversies, *Advances in Life Course Research* 9(1): 3–24. [https://doi.org/10.1016/S1040-2608\(04\)09001-X](https://doi.org/10.1016/S1040-2608(04)09001-X)
- Manning, W. D., and P. J. Smock. 2002. First comes cohabitation and then comes marriage? A research note, *Journal of Family Issues* 23(8): 1065–1087. <https://doi.org/10.1177/019251302237303>
- Martins, M. V., D. Vassard, CØ Hougaard, and L. Schmidt. 2018. The impact of ART on union dissolution: A register-based study in Denmark 1994–2010, *Human Reproduction* 33(3): 434–440. <https://doi.org/10.1093/humrep/dey002>
- McLanahan, S. 2004. Diverging destinies: How children are faring under the second demographic transition, *Demography* 41(4): 607–627. <https://doi.org/10.1353/dem.2004.0033>
- Mikolai, J. 2012. With or without you. Partnership context of first conceptions and births in Hungary, *Demográfia English Edition*, 55 (5): 37–60. <http://demografia.hu/en/publicationsonline/index.php/demografiaenglishedition/article/view/210>
- Mikolai, J. 2017. Partnership histories and the transition to motherhood in later reproductive ages in Europe, *Population* 72(1): 123–154. <https://doi.org/10.3917/popu.1701.0127>

- Morgan, S. P., and H. Rackin. 2010. The correspondence between fertility intentions and behavior in the United States, *Population and Development Review* 36 (1): 91–118. <https://doi.org/10.1111/j.1728-4457.2010.00319.x>
- Ní Bhrolcháin, M., and É Beaujouan. 2012. Fertility postponement is largely due to rising educational enrolment, *Population Studies* 66(3): 311–327. <https://doi.org/10.1080/00324728.2012.697569>
- Nitsche, N., and S. R. Hayford. 2020. Preferences, partners, and parenthood: Linking early fertility desires, marriage timing, and achieved fertility, *Demography* 57(6): 1975–2001. <https://doi.org/10.1007/s13524-020-00927-y>
- Nygren, K., and A. N. Andersen. 2001. Assisted reproductive technology in Europe, 1997. Results generated from European registers by ESHRE. European IVF-monitoring programme (EIM), for the European Society of Human Reproduction and Embryology (ESHRE), *Human Reproduction* 16(2): 384–391. <https://doi.org/10.1093/humrep/16.2.384>. PMID: 11157839
- Official Statistics of Finland (OSF). 2016. Births [e-publication]. ISSN = 1798–2413. Annual Review 2015. Helsinki: Statistics Finland [accessed: 28 January 2022]. Access method: [http://www.stat.fi/til/synt/2015/02/synt\\_2015\\_02\\_2016-12-08\\_tie\\_001\\_en.html](http://www.stat.fi/til/synt/2015/02/synt_2015_02_2016-12-08_tie_001_en.html).
- Official Statistics of Finland (OSF). 2021. Families [e-publication]. ISSN = 1798–3231. 2020. Helsinki: Statistics Finland [referred: 28 January 2022]. Access method: [http://www.stat.fi/til/perh/2020/perh\\_2020\\_2021-05-28\\_tie\\_001\\_en.html](http://www.stat.fi/til/perh/2020/perh_2020_2021-05-28_tie_001_en.html).
- Olivius, C., B. Friden, G. Borg, and C. Bergh. 2004. Why do couples discontinue in vitro fertilization treatment? A cohort study, *Fertility and Sterility* 81(2): 258–261. <https://doi.org/10.1016/j.fertnstert.2003.06.029>
- Passet-Wittig, J., and A. L. Greil. 2021. Factors associated with medical help-seeking for infertility in developed countries: A narrative review of recent literature, *Social Science and Medicine* 277: 113782. <https://doi.org/10.1016/j.socscimed.2021.113782>
- Pasteels, I., V. Lyssens-Danneboom, and D. Mortelmans. 2017. A life course perspective on living apart together: Meaning and incidence across Europe, *Social Indicators Research* 130: 799–817. <https://doi.org/10.1007/s11205-015-1189-x>
- Pelikh, A., K. R. Smith, M. Myrskylä, and A. Goisis. 2022. Medically assisted reproduction treatment types and birth outcomes: A between-family and within-family analysis, *Obstetrics and Gynecology* 139(2): 211–222. <https://doi.org/10.1097/AOG.0000000000004655>
- Pelikh, A., J. Mikolai, and H. Kulu. 2022. Make up or break up? Partnership transitions among young adults in England and Wales, *Advances in Life Course Research* 52: 100475. <https://doi.org/10.1016/j.alcr.2022.100475>
- Perelli-Harris, B., W. Sigle-Rushton, M. Kreyenfeld, T. Lappegård, R. Keizer, and C. Berghammer. 2010. The educational gradient of childbearing within cohabitation in Europe, *Population and Development Review* 36(4): 775–801. <https://doi.org/10.1111/j.1728-4457.2010.00357.x>
- Perelli-Harris, B., M. Kreyenfeld, W. Sigle-Rushton, R. Keizer, T. Lappegård, A. Jasilioniene, Caroline Berghammer et al. 2012. Changes in union status during the transition to parenthood in eleven European countries, 1970s to early 2000s, *Population Studies* 66(2): 167–182. <https://doi.org/10.1080/00324728.2012.673004>
- Poortman, A.-R. 2007. The first cut is the deepest? The role of the relationship career for union formation, *European Sociological Review* 23(5): 585–598. <https://doi.org/10.1093/esr/jcm024>
- Raab, M., and E. Struffolino. 2020. The heterogeneity of partnership trajectories to childlessness in Germany, *European Journal of Population* 36(1): 53–70. <https://doi.org/10.1007/s10680-019-09519-y>
- Raybould, A., and R. Sear. 2021. Children of the (gender) revolution: A theoretical and empirical synthesis of how gendered division of labour influences fertility, *Population Studies* 75(2): 169–190. <https://doi.org/10.1080/00324728.2020.1851748>
- Raymer, J., Q. Guan, R. Norman, W. Ledger, and G. M. Chambers. 2020. Projecting future utilization of medically assisted fertility treatments, *Population Studies* 74(1): 23–38. <https://doi.org/10.1080/00324728.2019.1676461>
- Rindfuss, R. R., and A. VandenHeuvel. 1990. Cohabitation: A precursor to marriage or an alternative to being single?, *Population and Development Review* 16(4): 703–726. <https://doi.org/10.2307/1972963>
- Rybińska, A., and P. S. Morgan. 2019. Childless expectations and childlessness over the life course, *Social Forces* 97(4): 1571–1602. <https://doi.org/10.1093/sf/soy098>
- Saarela, J., and F. Finnäs. 2014. Transitions within and from first unions: Educational effects in an extended windowing model, *Marriage and Family Review* 50(1): 35–54. <https://doi.org/10.1080/01494929.2013.851053>
- Sassler, S. 2004. The process of entering into cohabiting unions, *Journal of Marriage and Family* 66(2): 491–505. <https://doi.org/10.1111/j.1741-3737.2004.00033.x>
- Schmidt, L., B. Holstein, U. Christensen, and J. Boivin. 2005. Does infertility cause marital benefit?: An epidemiological study of 2250 women and men in fertility treatment, *Patient Education and Counseling* 59(3): 244–251. <https://doi.org/10.1016/j.pec.2005.07.015>

- Schmidt, L., T. Sobotka, J. G. Bentzen, and A. N. Andersen. on behalf of the ESHRE Reproduction and Society Task Force. 2012. Demographic and medical consequences of the postponement of parenthood, *Human Reproduction Update* 18(1): 29–43. <https://doi.org/10.1093/humupd/dmr040>
- Schnor, C. 2015. Does waiting pay off for couples? Partnership duration prior to household formation and union stability, *Demographic Research* 33(22): 611–652. <https://doi.org/10.4054/DemRes.2015.33.22>
- Schoen, R., N. M. Astone, Y. J. Kim, C. A. Nathanson, and J. M. Fields. 1999. Do fertility intentions affect fertility behavior?, *Journal of Marriage and the Family* 61(3): 790–799. <https://doi.org/353578>
- Seltzer, J. A. 2004. Cohabitation in the United States and Britain: Demography, kinship, and the future, *Journal of Marriage and Family* 66(4): 921–928. <https://doi.org/10.1111/j.0022-2445.2004.00062.x>
- Shanahan, M. J. 2000. Pathways to adulthood in changing societies: Variability and mechanisms in life course perspective, *Annual Review of Sociology* 26(1): 667–692. <https://doi.org/10.1146/annurev.soc.26.1.667>
- Smock, P. J., and W. D. Manning. 1997. Cohabiting partners' economic circumstances and marriage, *Demography* 34 (3): 331–341. <https://doi.org/10.2307/3038287>
- Somigliana, E., A. Paffoni, A. Busnelli, F. Filippi, L. Pagliardini, P. Vigano, and P. Vercellini. 2016. Age-related infertility and unexplained infertility: An intricate clinical dilemma, *Human Reproduction* 31 (7): 1390–1396. <https://doi.org/10.1093/humrep/dew066>
- Tosi, M., and A. Goisis. 2021. Mental health around the transition to first birth: Does medically assisted reproduction matter?, *Demography* 58(4): 1347–1371. <https://doi.org/10.1215/00703370-9335177>. PMID: 34047787.
- Verhaak, C. M., J. M. Smeenk, A. Van Minnen, J. A. Kremer, and F. W. Kraaijaat. 2005. A longitudinal, prospective study on emotional adjustment before, during and after consecutive fertility treatment cycles, *Human Reproduction* 20(8): 2253–2260. <https://doi.org/10.1093/humrep/dei015>
- Waldfoegel, J., T.-A. Craigie, and J. Brooks-Gunn. 2010. Fragile families and child wellbeing, *The Future of Children* 20(2): 87–112. <https://doi.org/10.1353/foc.2010.0002>
- Walschaerts, M., L. Bujan, J. Parinaud, R. Mieuisset, and P. Thonneau. 2013. Treatment discontinuation in couples consulting for male infertility after failing to conceive, *Fertility and Sterility* 99(5): 1319–1323. <https://doi.org/10.1016/j.fertnstert.2012.11.035>
- Wyns, C., C. De Geyter, C. Calhaz-Jorge, M. Kupka, T. Motrenko, J. Smeenk, C. Bergh et al. 2021. ART in Europe, 2017: Results generated from European registries by ESHRE, *Human Reproduction Open* 2021(3): hoab026. <https://doi.org/10.1093/hropen/hoab026>