Medically assisted reproduction and mental health: a 24-year longitudinal analysis using Finnish register data

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BACKGROUND: Medically assisted reproduction can negatively affect women’s mental health, particularly when the treatments do not result in a live birth. Although the number of women relying on medically assisted reproduction to conceive has grown rapidly, our knowledge about the mental health effects before, during, and after treatment is limited.

OBJECTIVE: This study aimed to understand the long-term association between medically assisted reproduction and mental health outcomes for women before, during, and after their treatments, and according to whether the treatment resulted in a live birth.

STUDY DESIGN: Using Finnish register data for the period from 1995 to 2018, we estimated the probability of psychotropic purchases (antidepressants, anxiolytics, hypnotics, and sedatives) for 3 groups of women who: (1) gave birth after natural conception, (2) gave birth after medically assisted reproduction treatments, or (3) underwent medically assisted reproduction but remained childless. We followed up women for up to 12 years before and 12 years after the reference date, which corresponded to the conception date for women with a first live birth either after a natural or a medically assisted conception, or the date of the last medically assisted reproduction treatment for women who had a live birth by the end of 2017. We estimated linear probability models before and after adjustment for sociodemographic characteristics.

RESULTS: The results show that women who did not have a live birth after undergoing medically assisted reproduction treatments purchased more psychotropics than women who gave birth after conceiving naturally or through medically assisted reproduction, and that these differences did not attenuate over time. Twelve years after the reference date, 17.73% (95% confidence interval, 16.82—18.63) of women who underwent medically assisted reproduction but remained childless purchased psychotropics vs 11.11% of women who gave birth after natural conception (95% confidence interval, 10.98—11.26) and 12.17% (95% confidence interval, 11.65—12.69) of women who gave birth after medically assisted reproduction treatments. In addition, women who conceived naturally and through medically assisted reproduction had very similar psychotropic use patterns from 3 years before conception to 4 years after, and over the long term. Adjustment for women’s sociodemographic characteristics did not change the results.

CONCLUSION: The similarities in psychotropic purchases of women who had a live birth, whether naturally or through medically assisted reproduction, suggest that the higher psychotropic use among women who remained childless after undergoing medically assisted reproduction were likely driven more by involuntary childlessness than by treatment-related stress. The results highlight the importance of counseling for women undergoing medically assisted reproduction treatments, especially if their attempts to conceive are unsuccessful.

Key words: fertility treatments, involuntary childlessness, mental health, psychotropic purchases, subfertility

Introduction

As childbearing is increasingly postponed and infertility treatments are becoming more widely available, the number of women relying on medically assisted reproduction (MAR), which includes techniques such as ovulation induction, artificial insemination, and assisted reproductive technology (including in vitro fertilization [IVF] and intra-cytoplasmic sperm injection), has grown rapidly across the globe. Between 1997 and 2016, IVF procedures have increased 5.3-fold in Europe and 4.6-fold in the United States.

Previous studies have suggested that MAR treatments can negatively affect women’s psychological well-being and cause psychological distress, anxiety, and depression. The mental health burden is higher for women whose treatments do not result in a live birth. Although some studies have found that women’s psychological well-being improves as they adjust to subfertility and/or childlessness, others have reported long-term negative effects.

However, evidence about women’s mental health as they undergo MAR treatments is limited. The few existing longitudinal studies on this topic have limitations. First, the beginning of the follow-up period was often around the time when the MAR treatments were initiated, that is, when the women were already struggling with subfertility. This approach makes it difficult to determine the extent to which the mental health levels of women who undergo MAR diverge from their pretreatment levels. Second, they tended to use small and nonrepresentative samples collected in MAR treatment clinics, which are subject to self-reporting and recall bias. Finally, none of these studies directly documented differences between women who conceived naturally, women who conceived through MAR, and women who remained childless after MAR treatments.

In this study, we analyze the use of psychotropic medication among women who underwent MAR to conceive and compare it with that of women who...
**Key findings**

Women who did not have a live birth after undergoing MAR treatments purchased more psychotropic medication than women who gave birth after conceiving naturally or through MAR. Differences did not attenuate over time, even when adjusting for sociodemographic characteristics. Women who conceived naturally and through MAR had very similar psychotropic use from 3 years before conception to 4 years after, and over the long term.

**What does this add to what is known?**

Similarities in psychotropic purchases of women who had a live birth, whether naturally or through MAR, suggest that the higher psychotropic use among women who remained childless after undergoing MAR is likely to be driven more by involuntary childlessness than by treatment-related stress.

**Materials and Methods**

**Study population**

We included all women in Finnish administrative registers who were born between 1950 and 1995, were childless in 1995, and gave birth to their first child (either after natural conception or MAR) between ages 20 and 45 from 1996 to 2016 or underwent MAR treatments from 1995 to 2016 but were childless in 2017.

**Reference date**

We set as the reference date the conception date (estimated as birthdate minus gestational age) for women who had a first live birth either after a natural or a MAR conception, or the date of the last MAR treatment for women with no live birth by the end of 2017.

**Outcome**

Psychotropic medications are commonly used to treat depression, anxiety, insomnia, and other related mental health problems. Information about psychotropic purchases prescribed in the public and private sectors between January 1995 and December 2018 was gathered from the National Prescription Register. In Finland, all psychotropic medication is prescribed by clinical doctors, and residents are entitled to reimbursement for medication expenses, usually provided directly at pharmacies. The prescription register includes information on the purchase date and medication type, classified according to the World Health Organization’s Anatomical Therapeutic Chemical (ATC) Classification System (WHO, 2013). We included all purchases of antidepressants (ATC codes N06A), anxiolytics (ATC codes N05B), and hypnotics and sedatives (ATC codes N05C).

We divided our follow-up period into 6-month intervals before and after the reference date. For each interval, the outcome variable takes a value of 1 if a woman purchased psychotropics, and of 0 otherwise.

**Medically assisted reproduction treatments**

We identified women undergoing MAR treatments between 1995 and 2016 using administrative data from the prescription, healthcare, and birth registers.

To identify MAR treatments in the prescription register, we updated Hemminki et al’s algorithm by including 2 drugs introduced after 2000 and some restrictions on stand-alone treatments (more information in the Appendix 1). We identified children conceived through MAR by combining each woman’s purchases of fertility drugs with her child’s birthdate (retrieved from the Finnish Medical Birth Register). We excluded purchases of drugs used in infertility treatment when also plausibly used to treat other medical conditions, such as cancer. The healthcare register contains information on dates and types of MAR procedures in the public sector. We identified children conceived through MAR by combining the dates of MAR procedures with the child’s birthdate. Finally, to complement this information, we identified in the birth register children born after MAR treatments from 2004 onward.

Our 3 groups of interest were women who: (1) had their first live birth after a natural conception (NC), (2) had their first live birth after a MAR conception (MAR+), and (3) remained childless after MAR treatments (MAR−). Women who conceived after MAR treatments could be identified from any of the 3 sources, and women who underwent MAR treatments not resulting in a live birth were identified using the procedure and/or drug registers. We assumed a woman conceived naturally if none of the data sources indicated that her child was conceived through MAR.

**Treatment length**

We defined treatment length as the time between the first and last MAR treatment, and created a binary variable that takes a value of 1 for women who underwent treatments for >2 years, and of 0 otherwise. The 2-year threshold was

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**AJOG at a Glance**

**Why was this study conducted?**

The number of women relying on medically assisted reproduction (MAR) to conceive has grown rapidly, but our knowledge about their mental health as they undergo MAR treatments is limited.

**Materials and Methods**

**Study population**

We included all women in Finnish administrative registers who were born between 1950 and 1995, were childless in 1995, and gave birth to their first child (either after natural conception or MAR) between ages 20 and 45 from 1996 to 2016 or underwent MAR treatments from 1995 to 2016 but were childless in 2017.

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**Treatment length**

We defined treatment length as the time between the first and last MAR treatment, and created a binary variable that takes a value of 1 for women who underwent treatments for >2 years, and of 0 otherwise. The 2-year threshold was
chosen on the basis of the average treatment length (1.98 years) in our sample. For cases in which MAR treatment was identified only through the birth register (11.5% of MAR+ women)—which does not provide information on treatment length—we imputed the first treatment date using age-specific average times between the start of MAR treatments and conception.

**Period of observation**

Data on psychotropic purchases from 1995 to 2018 and MAR treatments between 1995 and 2016 allowed us to follow women for up to 12 years before and after the reference date, resulting in an unbalanced panel with a total of 48 6-month intervals (24 years), and a median follow-up of 35 intervals (18 years) (appendix Table 2A).

**Exclusions**

We excluded from the sample women who were aged <20 or >45 years at the reference date. We excluded women with triplet pregnancies, which are associated with more distress.17 We excluded psychotropic purchases that occurred before women reached the age of 18 years. Furthermore, we excluded women who were living abroad in any given year because medication purchases are recorded only for women residing in Finland. Finally, we excluded observations with missing values in the covariates (0.07%). This resulted in a sample of 575,921 women. Of them, 97.73% had a first birth from 1996 to 2016 (5.89% after MAR), and 2.27% remained childless after undergoing MAR treatments.

**Statistical analysis**

We estimated generalized estimating equation linear models using the 6-month intervals as repeated panel observations and robust standard errors with exchangeable correlation structure. We modeled changes in psychotropic purchases by interacting the 3 groups of interest (women who had a live birth after a natural or a MAR conception, and women who remained childless after MAR treatments) with the 6-month period variable (time-varying), which resulted in 96 coefficients representing the probability of psychotropic use for MAR+ and MAR− against NC women for each period.

We estimated 2 models. In Model 1, we adjusted for calendar year to control for increasing psychotropic use over time,18 and for age, because, on average, psychotropic use increases with age,19 and women who undergo MAR are older than women who conceive naturally.20 Because women who undergo MAR treatments are, on average, socioeconomically advantaged,21 Model 2 additionally controls for time-varying sociodemographic factors: household income decile (categorical), cohabitation status (binary), and hospital district of residence (categorical). Because psychotropic purchases may be affected by transition to a higher-parity birth, Model 2 also adjusts for transition to a second-, third-, or higher-order birth (binary). To investigate whether treatment duration moderated the association between MAR treatments and psychotropic purchases, we estimated Model 1 by interacting the period variable with a variable that identified the 3 interest groups and their treatment length, resulting in 5 categories: NC, MAR+ >2 years, MAR+ <2 years, MAR− >2 years, and MAR− <2 years.

All analyses were conducted in Stata, version 16 (StataCorp, College Station, TX). The study was exempt from institutional review board approval because it was not necessary given the previous institutional approval of the overall project (European Research Council grant #803958).

**Results**

Table shows that 33.4% of women purchased psychotropics in at least 1 6-month period during the 24-year follow-up, with 15% having purchased at least once in the 12 years before the first conception or last MAR cycle, and 27.3% in the following 12 years. Psychotropic use differed across the 3 groups: 14.5% and 18.9% of NC and
MAR+ women, respectively, purchased psychotropics before they conceived their first child, vs 25% of MAR− women.

We observed substantial differences across groups over time (Figure 1). Differences in psychotropic purchases between women who underwent MAR treatments and women who conceived naturally emerged as early as 9 to 10 years before conception or last treatment cycle, with the latter being more likely to purchase psychotropics (MAR−: 3.25%; 95% confidence interval [CI], 2.71–3.79; MAR+: 2.51%; 95% CI, 2.27–2.75) than the former (1.48%; 95% CI, 1.14–1.58).

Five years before conception or the last cycle, the psychotropic purchases of women undergoing MAR diverged (Figure 1; full model results in appendix Table 3A). The share of women taking psychotropics remained at 4.86% for MAR+ women (95% CI, 4.59–5.13), but increased to 6.45% (up 16.02% from the previous year) among MAR− women.

Women who had a child either through MAR or naturally had similar levels of psychotropic use from 3 years before conception to 4 years after. Nonetheless, although the probability of purchasing psychotropics decreased gradually from 2 years before conception onward among MAR+ women, no shift occurred among NC women until immediately before conception. Conversely, women who remained childless after MAR increased their psychotropic use sharply after the last MAR cycle. This resulted in a large gap in psychotropic purchases around the reference date, with the latter being 45.69% and 59.48% more likely to purchase psychotropics than women who delivered a live birth through MAR or naturally, respectively.

To illustrate the fluctuations in psychotropic purchases among women who underwent MAR treatments and either gave birth or remained childless, Figure 2 shows the ratio of predicted margins estimated using the delta method for these women relative to women who conceived naturally. The figure shows a clear peak in psychotropic purchases among MAR− women.

When adjusting for sociodemographic characteristics in Model 2, differences in psychotropic purchases across groups remained consistent with Model 1 (appendix Figure 1A; appendix Table 3A). We re-estimated all models, excluding women who underwent fertility treatments but conceived naturally, and the results held (appendix Figure 2A).

Lengthier MAR treatments were associated with higher psychotropic purchases regardless of the treatment result (Figure 3; appendix Table 4A). For example, women undergoing lengthier treatments were 37.28% (MAR+−) and 32.47% (MAR−) more likely to purchase psychotropics around the date of conception or last cycle compared with their counterparts undergoing shorter treatments, and these differences shrank after the reference date. Nonetheless, the results were consistent with those of Model 1: women who had a child following MAR had lower psychotropic use than women who underwent MAR and remained childless.

Comment
Principal findings
The results show that psychotropic use was higher among women who remained childless after MAR than...
among women who conceived naturally or through MAR. This pattern persisted over the long term, in line with findings of other studies.\textsuperscript{3,5,10,12,13} Adjustment for sociodemographic characteristics did not change the pattern of results.

Although women who conceived via MAR had higher psychotropic use than women who conceived naturally at the beginning of the observation window, their psychotropic use was similar from 3 years before to 4 years after conception, and the differences over the longer term remained small, and were unlikely to be clinically relevant.

\textbf{Results in the context of what is known}

Although the finding of similarities in long-term psychotropic use between women who conceived naturally and through MAR is consistent with previous studies,\textsuperscript{3,22} in this study we were able to significantly extend the observation window, and thus provide further evidence about the mental well-being of this growing population sub-group.

Our results significantly deepen the understanding of the link between MAR and mental health in 3 ways. First, we showed that differences between women for whom MAR treatments did not result in a live birth and women who delivered a live birth either naturally or through MAR arose as early as 5 years before the date of conception or last MAR cycle, with the former increasing their psychotropic uptake more than the latter. A possible explanation for the emergence of this gap well before women ended MAR treatments is that the former may have already received a diagnosis of subfertility and began the infertility treatment process. There is evidence that the start of infertility treatments is related to increased levels of depression and anxiety.\textsuperscript{22,23}

Second, we showed that there was a sharp increase in psychotropic purchases following the last failed treatment cycle, which could have been driven by participants experiencing negative emotions on realizing that they were unlikely to have a biological child.\textsuperscript{13} Although this stark increase could also be related to women separating from their partners and suspending treatment,\textsuperscript{24} adjusting for partnership status in the analyses did not alter the results. By contrast, women who had a live birth either naturally or after undergoing MAR treatments reduced their psychotropic purchases when trying to conceive and while pregnant. The reasons for this could be two-fold: on the one hand, the decrease and slow return to preconception psychotropic purchase levels (around 36 months) could be related to a temporary increase in subjective well-being around the time of first birth.\textsuperscript{25} On the other, pregnant women may decrease their psychotropic uptake during pregnancy or postpartum because medications may have negative side effects,\textsuperscript{26} although some medications are safe to use during this period.\textsuperscript{27–29}

Third, although the psychotropic purchases of the 2 MAR groups were similar at the beginning of the observation window, they began diverging from around 6 years before conception or the last MAR cycle, and the differences never fully attenuated during follow-up. The stark increase in psychotropic uptake that occurred around the last treatment date for women who remained childless could suggest that their worse mental health outcomes were driven more by involuntary childlessness than by treatment-related stress. The analyses on the moderating role of the MAR treatment length further supported this hypothesis. Within the MAR+ and MAR− groups, women who underwent MAR for \textgreater{}2 years had higher psychotropic use at the beginning and end of the follow-up period. However, the differences became smaller over the longer term as the purchases of women who underwent longer MAR processes in both the MAR+ and MAR− groups tended to converge with those of their counterparts who underwent shorter MAR processes; that is, childbearing status was more important in determining women’s psychotropic purchases than MAR treatment length. The results reinforce the hypothesis that higher psychotropic purchases were associated with unintended childlessness after

\begin{table}[h]
\centering
\begin{tabular}{|c|c|}
\hline
MAR+ & MAR− \hline
\end{tabular}
\caption{Comparison of psychotropic purchases between MAR+ and MAR− groups.}
\end{table}
undergoing MAR treatments, whereas the moderating effect of the length of the MAR process was small.

Clinical implications
Considering the increasing use of MAR treatments, the results of this study underscore the importance of offering counseling to women undergoing MAR treatments, particularly if their attempts to conceive through MAR are unsuccessful. The provision of psychological support and counseling during the MAR process may reduce the likelihood of women ending treatments prematurely because of stress; prepare women better for the potential failure of treatments; and help women deal with the grieving process if their desire to have a child is unfulfilled. However, more evidence is needed to determine whether and to what extent such psychological support is effective.

Research implications
We found that involuntary childlessness has associated mental health costs, but more work is necessary to establish the mechanisms underlying this association. Moreover, the results show that the estimation of the MAR effect on mental health is sensitive to time of measurement during the MAR process, that is, could be over- or underestimated depending on how the baseline and follow-up are defined with respect to conception/last MAR cycle.

Strengths and limitations
This study has several strengths. First, the use of a large and nationally representative register allowed us to investigate the association between MAR treatments and psychotropic purchases free of self-reporting biases, and to investigate this association before, upon, and after the conception date (or the last cycle date for unsuccessful MAR cases) in 6-month intervals. Second, the long follow-up allowed us to observe psychotropic purchases when women were most likely not yet struggling with infertility or MAR treatments. Third, we identified and compared women who had a live birth naturally or after MAR with women who underwent MAR but whose treatments did not result in a live birth, which is relevant for understanding how MAR treatments and their outcomes affect women’s mental health. Finally, by focusing on psychotropics, which are widely used to treat depression and anxiety in women of reproductive age, we were able to observe common psychiatric disorders and not only the more acute or severe cases (eg, psychiatric hospitalizations).

The study also has limitations. First, the analysis focused on Finland, a context with subsidized medical care and medication costs, which could limit the generalizability of our findings to other settings. However, in contexts where MAR treatments are not as well subsidized as in Finland, the association between psychotropic uptake and MAR treatments could be even stronger because of higher levels of stress related to income loss. Second, although the analysis of psychotropic purchases allowed us to observe women who suffer from common psychiatric disorders, there are other nonpharmacologic interventions such as therapy and counseling that we did not consider. Thirdly, we were unable to establish whether the association between MAR treatments and psychotropic purchases was causal given that subfertility is associated with higher levels of stress, but using psychotropics is also associated with infertility. Nevertheless, additional analyses (provided in the appendix figure 3A) demonstrate that our results remain similar when excluding all women who had purchased psychotropics before the reference date, suggesting that our conclusions are unlikely to be primarily related to an underlying higher propensity to use psychotropic medications among women who undergo MAR and remain childless. Fourth, although the use of administrative registers has many advantages, they do not provide information on the causes of infertility or cases of abnormal pregnancies. Finally, we were unable to account for the role of pregnancy loss because registry data record only those that require hospitalization. Nevertheless, it is unlikely that results were driven by miscarriages because we did not observe differences in psychotropic uptake before the reference date between MAR+ and NC women although the former experience, on average, a higher number of miscarriages because they suffer from subfertility.

Conclusions
The similarities in the psychotropic purchases of women who had a live birth, whether naturally or through MAR, suggest that the higher psychotropic use

| Psychotropic purchases | NC | MAR+ | MAR− | Total |
|------------------------|----|------|------|-------|
| Before conception or last cycle date | 14.48 | 18.85 | 25 | 14.98 |
| After conception or last cycle date | 27.04 | 27.87 | 37.9 | 27.33 |
| Before and/or after conception or last cycle date | 32.93 | 36.15 | 45.24 | 33.4 |

TABLE
Psychotropic purchases before and after conception or last medically assisted reproduction treatment

| Psychotropic purchases before and after conception or last medically assisted reproduction treatment | NC | MAR+ | MAR− | Total |
|-------------------------------------------------------------------------------------------------|----|------|------|-------|
| Psychotropic purchases before and after conception or last medically assisted reproduction treatment | Mean (%) | Mean (%) | Mean (%) | Mean (%) |
| Psychotropic purchases before and after conception or last medically assisted reproduction treatment | SD | SD | SD | SD |
| Before conception or last cycle date | 14.48 | 18.85 | 25 | 14.98 |
| After conception or last cycle date | 27.04 | 27.87 | 37.9 | 27.33 |
| Before and/or after conception or last cycle date | 32.93 | 36.15 | 45.24 | 33.4 |

Number of observations | 528,913 | 33,942 | 13,066 | 575,921

MAR+, women who conceived after medically assisted reproduction treatments; MAR−, women who underwent medically assisted reproduction treatments and remained childless; NC, women who conceived naturally. SD, standard deviation.

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among women who remained childless after undergoing MAR were likely driven more by involuntary childlessness than by treatment-related stress. The results highlight the importance of counseling for women undergoing MAR treatments, especially if their attempts to conceive are unsuccessful.

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Supplementary Material

Appendix 1: To identify women undergoing medically assisted reproduction (MAR) and children conceived through MAR, we used the algorithm by Hemminki et al. (2003), modified and further developed by Alina Pelikh to use data from the national prescription, healthcare, and birth registers:

We identified MAR treatments and children conceived through MAR between 1996 and 2016 using administrative data from the prescription register, the healthcare register, and the birth register. These sources cover different periods: the prescription register contains data from 1995 to 2018, the healthcare register contains data for the 1996-2017 period, and the birth register contains data on MAR births for the 2004-2017 period only.

**Prescription register**

To identify MAR in the prescription register, an original algorithm developed by (Hemminki et al. 2003) was updated by including corofollitropin alfa and combination products of gonadotropin. As these drugs were not used in significant volumes until 2012, these were minor changes, but they added a few MAR cases. Some of the ovulation induction drugs (e.g., clomifen) were no longer reimbursed after the year 2000. All other new drugs that could have been added to the algorithm (i.e. letrozole, ganirelix, cetrorelix) were unfortunately not recorded in the prescription register. 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 and were used consistently across the study period.

**Healthcare register**

The healthcare register contains information on diagnoses of infertility and MAR procedures carried out in public sector clinics. To identify MAR children from the healthcare register, a threshold of 44 weeks between a MAR procedure (ovulation induction; insemination; IVF; FET; ICSI) and the birth of a child was used. If multiple procedures fell into this window, the procedure closest to the birthdate was chosen. A sensitivity analysis in which we extended the window up to 46 weeks showed that only a small number of cases (<200) would have been added to those already identified.

**Birth register**

From 2004 onwards, children could be identified as conceived through MAR treatments including ovulation induction, insemination, and IVF.

![FIGURE 1A](image-url)

**Predicted probabilities of psychotropics purchases, by group (Model 2)**

Note: NC refers to women who conceived naturally, MAR+ refers to women who conceived after MAR treatments and MAR- to women who underwent MAR treatments but did not deliver a live birth by the end of 2017. Model 2 estimates are adjusted for calendar year, age, household income decile (categorical), cohabitation status (binary), hospital district of residence, and transition to a second-, third-, or higher-order birth.

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FIGURE 2A
Predicted probabilities of psychotropics purchases excluding from the NC group women who underwent MAR, by group (unadjusted Model)

Note: NC refers to women who conceived naturally, MAR+ refers to women who conceived after MAR treatments and MAR- to women who underwent MAR treatments but did not deliver a live birth by the end of 2017. Estimates adjusted for calendar year and age.

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FIGURE 3A
Predicted probabilities of psychotropics purchases excluding women who purchased psychotropics before T0, by group (adjusted Model)

Note: NC refers to women who conceived naturally, MAR+ refers to women who conceived after MAR treatments and MAR- to women who underwent MAR treatments but did not deliver a live birth by the end of 2017. Estimates are adjusted for calendar year, age, household income decile (categorical), cohabitation status (binary), hospital district of residence, and transition to a second-, third-, or higher-order birth.

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## TABLE 1A
### MAR algorithm sources

|                     | Prescription register | Healthcare register | Birth register                                      |
|---------------------|-----------------------|---------------------|-----------------------------------------------------|
| Period covered      | 1995-2018             | 1996-2017           | 1987-2017 (information on MAR since 2004)          |
| MAR identification  | Data on purchases of fertility drugs. Updated algorithm developed by (Hemminki et al. 2003) calculating intervals since the last purchase of drugs and childbirth. 4 types of MAR:  
  - Ovulation induction  
  - IVF and other ART  
  - Other MAR | Data on infertility diagnoses and MAR procedures. Algorithm calculating interval since the last MAR procedure and childbirth. 5 types of MAR:  
  - Ovulation induction  
  - Insemination  
  - IVF  
  - FET  
  - ICSI | Data on births and pregnancy. 3 types of MAR:  
  - Ovulation induction  
  - Insemination  
  - IVF |

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| Period                      | NC     | MAR+   | MAR-   | Total   |
|-----------------------------|--------|--------|--------|---------|
| 138-144 months before       | 190,996| 16,740 | 5,422  | 213,158 |
| 132-138 months before       | 201,172| 17,600 | 5,682  | 224,454 |
| 126-132 months before       | 211,895| 18,302 | 5,916  | 236,113 |
| 120-126 months before       | 222,334| 19,053 | 6,320  | 247,707 |
| 114-120 months before       | 233,048| 19,709 | 6,607  | 259,364 |
| 108-114 months before       | 243,466| 20,464 | 6,917  | 270,847 |
| 102-108 months before       | 254,654| 21,161 | 7,183  | 282,998 |
| 96-102 months before        | 265,340| 21,892 | 7,484  | 294,716 |
| 90-96 months before         | 276,838| 22,413 | 7,764  | 307,015 |
| 84-90 months before         | 287,792| 23,073 | 8,091  | 318,956 |
| 78-84 months before         | 299,337| 23,638 | 8,395  | 331,370 |
| 72-78 months before         | 310,504| 24,237 | 8,716  | 343,457 |
| 66-72 months before         | 321,050| 24,888 | 9,178  | 344,112 |
| 60-66 months before         | 332,488| 25,999 | 9,389  | 367,876 |
| 54-60 months before         | 344,611| 26,057 | 9,751  | 379,419 |
| 48-54 months before         | 356,311| 27,111 | 10,182 | 394,604 |
| 42-48 months before         | 368,010| 28,142 | 10,556 | 406,708 |
| 36-42 months before         | 379,622| 29,245 | 10,997 | 409,864 |
| 30-36 months before         | 391,255| 30,217 | 11,384 | 423,856 |
| 24-30 months before         | 402,110| 31,241 | 11,780 | 445,131 |
| 18-24 months before         | 414,837| 32,137 | 12,136 | 469,110 |
| 12-18 months before         | 427,212| 33,080 | 12,546 | 452,747 |
| 6-12 months before          | 439,668| 33,657 | 12,807 | 459,132 |
| 0-6 months before           | 452,877| 33,905 | 12,993 | 469,775 |
| 0-6 months after            | 452,877| 33,905 | 12,993 | 469,775 |
| 6-12 months after           | 452,959| 33,922 | 12,693 | 575,210 |
| 12-18 months after          | 454,118| 33,478 | 12,407 | 570,003 |
| 18-24 months after          | 456,347| 32,523 | 12,081 | 557,951 |
| 24-30 months after          | 458,128| 31,573 | 11,750 | 546,451 |
| 30-36 months after          | 460,271| 30,660 | 11,424 | 532,355 |
| 36-42 months after          | 462,104| 29,812 | 11,132 | 523,048 |
| 42-48 months after          | 472,123| 28,864 | 10,813 | 510,800 |
| 48-54 months after          | 472,816| 27,987 | 10,525 | 499,328 |
| 54-60 months after          | 473,196| 27,004 | 10,215 | 487,415 |
| 60-66 months after          | 473,746| 26,144 | 9,928  | 475,818 |
| 66-72 months after          | 474,677| 25,143 | 9,609  | 463,429 |
| 72-78 months after          | 475,132| 24,264 | 9,333  | 459,729 |
| 78-84 months after          | 475,125| 23,257 | 9,027  | 439,409 |
| 84-90 months after          | 475,526| 22,351 | 8,795  | 427,672 |

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| Period               | NC       | MAR+     | MAR-     | Total   |
|---------------------|----------|----------|----------|---------|
| 90-96 months after  | 385,221  | 21,362   | 8,519    | 415,102 |
| 96-102 months after | 374,159  | 20,596   | 8,292    | 403,047 |
| 102-108 months after| 362,956  | 19,635   | 7,982    | 390,573 |
| 108-114 months after| 352,105  | 18,826   | 7,767    | 378,698 |
| 114-120 months after| 341,049  | 17,989   | 7,521    | 366,559 |
| 120-126 months after| 330,329  | 17,178   | 7,301    | 354,808 |
| 126-132 months after| 319,587  | 16,257   | 7,011    | 342,855 |
| 132-138 months after| 308,874  | 15,528   | 6,809    | 331,211 |
| 138-144 months after| 297,745  | 14,646   | 6,522    | 318,913 |
| VARIABLES  | Model (1)        | Model (2)        |
|------------|------------------|------------------|
| 2.period   | 0.001***         | -0.001***        |
|            | (0.000)          | (0.000)          |
| 3.period   | 0.002***         | -0.001***        |
|            | (0.000)          | (0.000)          |
| 4.period   | 0.003***         | -0.002***        |
|            | (0.000)          | (0.000)          |
| 5.period   | 0.004***         | -0.002***        |
|            | (0.000)          | (0.000)          |
| 6.period   | 0.006***         | -0.002***        |
|            | (0.000)          | (0.000)          |
| 7.period   | 0.007***         | -0.002***        |
|            | (0.000)          | (0.000)          |
| 8.period   | 0.009***         | -0.001***        |
|            | (0.000)          | (0.000)          |
| 9.period   | 0.011***         | -0.000           |
|            | (0.000)          | (0.000)          |
| 10.period  | 0.013***         | 0.001**          |
|            | (0.000)          | (0.000)          |
| 11.period  | 0.015***         | 0.002***         |
|            | (0.000)          | (0.000)          |
| 12.period  | 0.017***         | 0.004***         |
|            | (0.000)          | (0.000)          |
| 13.period  | 0.023***         | 0.009***         |
|            | (0.001)          | (0.001)          |
| 14.period  | 0.025***         | 0.010***         |
|            | (0.001)          | (0.001)          |
| 15.period  | 0.026***         | 0.012***         |
|            | (0.001)          | (0.001)          |
| 16.period  | 0.028***         | 0.013***         |
|            | (0.001)          | (0.001)          |
| 17.period  | 0.030***         | 0.014***         |
|            | (0.001)          | (0.001)          |
| 18.period  | 0.032***         | 0.016***         |
|            | (0.001)          | (0.001)          |
| 19.period  | 0.033***         | 0.018***         |
|            | (0.001)          | (0.001)          |
| 20.period  | 0.035***         | 0.020***         |
|            | (0.001)          | (0.001)          |
| 21.period  | 0.036***         | 0.021***         |
|            | (0.001)          | (0.001)          |

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| VARIABLES | Model (1)  | Model (2)  |
|-----------|------------|------------|
|           | (0.001)    | (0.001)    |
| 22.period | 0.037***   | 0.022***   |
|           | (0.001)    | (0.001)    |
| 23.period | 0.038***   | 0.024***   |
|           | (0.001)    | (0.001)    |
| 24.period | 0.036***   | 0.023***   |
|           | (0.001)    | (0.001)    |
| 26.period | 0.016***   | 0.003***   |
|           | (0.001)    | (0.001)    |
| 27.period | 0.013***   | -0.000     |
|           | (0.001)    | (0.001)    |
| 28.period | 0.025***   | 0.011***   |
|           | (0.001)    | (0.001)    |
| 29.period | 0.031***   | 0.016***   |
|           | (0.001)    | (0.001)    |
| 30.period | 0.034***   | 0.020***   |
|           | (0.001)    | (0.001)    |
| 31.period | 0.037***   | 0.026***   |
|           | (0.001)    | (0.001)    |
| 32.period | 0.041***   | 0.031***   |
|           | (0.001)    | (0.001)    |
| 33.period | 0.046***   | 0.036***   |
|           | (0.001)    | (0.001)    |
| 34.period | 0.050***   | 0.041***   |
|           | (0.001)    | (0.001)    |
| 35.period | 0.054***   | 0.045***   |
|           | (0.001)    | (0.001)    |
| 36.period | 0.057***   | 0.049***   |
|           | (0.001)    | (0.001)    |
| 37.period | 0.061***   | 0.053***   |
|           | (0.001)    | (0.001)    |
| 38.period | 0.063***   | 0.055***   |
|           | (0.001)    | (0.001)    |
| 39.period | 0.066***   | 0.058***   |
|           | (0.001)    | (0.001)    |
| 40.period | 0.069***   | 0.061***   |
|           | (0.001)    | (0.001)    |
| 41.period | 0.072***   | 0.063***   |
|           | (0.001)    | (0.001)    |
**TABLE 3A**
Model (1) and Model (2) full estimation results (generalized estimating equation linear models) (continued)

| VARIABLES                  | Model (1)  | Model (2)  |
|----------------------------|------------|------------|
|                            |            |            |
| 42.period                  | 0.076***   | 0.066***   |
|                            | (0.001)    | (0.001)    |
|                            |            |            |
| 43.period                  | 0.079***   | 0.069***   |
|                            | (0.001)    | (0.001)    |
|                            |            |            |
| 44.period                  | 0.082***   | 0.071***   |
|                            | (0.001)    | (0.001)    |
|                            |            |            |
| 45.period                  | 0.085***   | 0.073***   |
|                            | (0.001)    | (0.001)    |
|                            |            |            |
| 46.period                  | 0.088***   | 0.075***   |
|                            | (0.001)    | (0.001)    |
|                            |            |            |
| 47.period                  | 0.093***   | 0.079***   |
|                            | (0.001)    | (0.001)    |
|                            |            |            |
| 48.period                  | 0.096***   | 0.082***   |
|                            | (0.001)    | (0.001)    |
|                            |            |            |
| 49.period                  | 0.099***   | 0.085***   |
|                            | (0.001)    | (0.001)    |
|                            |            |            |
| 1.art_treat (ref = NC)     | 0.005***   | 0.001      |
|                            | (0.001)    | (0.001)    |
|                            |            |            |
| 2.art_treat (ref = NC)     | 0.013***   | 0.010***   |
|                            | (0.003)    | (0.003)    |
|                            |            |            |
| 2.period#1.art_treat (ref = NC) | 0.002* | 0.002** |
|                            | (0.001)    | (0.001)    |
|                            |            |            |
| 2.period#2.art_treat (ref = NC) | 0.005* | 0.005** |
|                            | (0.002)    | (0.002)    |
|                            |            |            |
| 3.period#1.art_treat (ref = NC) | 0.003** | 0.004*** |
|                            | (0.001)    | (0.001)    |
|                            |            |            |
| 3.period#2.art_treat (ref = NC) | 0.001 | 0.003 |
|                            | (0.003)    | (0.003)    |
|                            |            |            |
| 4.period#1.art_treat (ref = NC) | 0.005*** | 0.006*** |
|                            | (0.001)    | (0.001)    |
|                            |            |            |
| 4.period#2.art_treat (ref = NC) | 0.005 | 0.006** |
|                            | (0.003)    | (0.003)    |
|                            |            |            |
| 5.period#1.art_treat (ref = NC) | 0.005*** | 0.007*** |
|                            | (0.001)    | (0.001)    |
|                            |            |            |
| 5.period#2.art_treat (ref = NC) | 0.009*** | 0.011*** |
|                            | (0.003)    | (0.003)    |
|                            |            |            |
| 6.period#1.art_treat (ref = NC) | 0.005*** | 0.007*** |
|                            | (0.001)    | (0.001)    |
|                            |            |            |
| 6.period#2.art_treat (ref = NC) | 0.006* | 0.009*** |

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TABLE 3A
Model (1) and Model (2) full estimation results (generalized estimating equation linear models) (continued)

| VARIABLES                        | Model (1) | Model (2) |
|----------------------------------|-----------|-----------|
|                                  | (0.003)   | (0.003)   |
| 7.period#1.art_treat (ref= NC)   | 0.006***  | 0.009***  |
|                                  | (0.001)   | (0.001)   |
| 7.period#2.art_treat (ref= NC)   | 0.008**   | 0.012***  |
|                                  | (0.003)   | (0.003)   |
| 8.period#1.art_treat (ref= NC)   | 0.007***  | 0.010***  |
|                                  | (0.002)   | (0.002)   |
| 8.period#2.art_treat (ref= NC)   | 0.011***  | 0.015***  |
|                                  | (0.003)   | (0.003)   |
| 9.period#1.art_treat (ref= NC)   | 0.005***  | 0.009***  |
|                                  | (0.002)   | (0.002)   |
| 9.period#2.art_treat (ref= NC)   | 0.012***  | 0.016***  |
|                                  | (0.003)   | (0.003)   |
| 10.period#1.art_treat (ref= NC)  | 0.006***  | 0.010***  |
|                                  | (0.002)   | (0.002)   |
| 10.period#2.art_treat (ref= NC)  | 0.014***  | 0.018***  |
|                                  | (0.003)   | (0.003)   |
| 11.period#1.art_treat (ref= NC)  | 0.008***  | 0.012***  |
|                                  | (0.002)   | (0.002)   |
| 11.period#2.art_treat (ref= NC)  | 0.015***  | 0.020***  |
|                                  | (0.004)   | (0.004)   |
| 12.period#1.art_treat (ref= NC)  | 0.008***  | 0.013***  |
|                                  | (0.002)   | (0.002)   |
| 12.period#2.art_treat (ref= NC)  | 0.013***  | 0.019***  |
|                                  | (0.004)   | (0.004)   |
| 13.period#1.art_treat (ref= NC)  | 0.004**   | 0.009***  |
|                                  | (0.002)   | (0.002)   |
| 13.period#2.art_treat (ref= NC)  | 0.008**   | 0.014***  |
|                                  | (0.003)   | (0.003)   |
| 14.period#1.art_treat (ref= NC)  | 0.005***  | 0.010***  |
|                                  | (0.002)   | (0.002)   |
| 14.period#2.art_treat (ref= NC)  | 0.009**   | 0.015***  |
|                                  | (0.004)   | (0.004)   |
| 15.period#1.art_treat (ref= NC)  | 0.005***  | 0.010***  |
|                                  | (0.002)   | (0.002)   |
| 15.period#2.art_treat (ref= NC)  | 0.013***  | 0.020***  |
|                                  | (0.004)   | (0.004)   |
| 16.period#1.art_treat (ref= NC)  | 0.004**   | 0.010***  |
|                                  | (0.002)   | (0.002)   |

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| VARIABLES | Model (1) | Model (2) |
|-----------|-----------|-----------|
| 16.period#2.art_treat (ref = NC) | 0.014*** | 0.020*** |
|           | (0.004)  | (0.004)  |
| 17.period#1.art_treat (ref = NC) | 0.001   | 0.007*** |
|           | (0.002)  | (0.002)  |
| 17.period#2.art_treat (ref = NC) | 0.014*** | 0.021*** |
|           | (0.004)  | (0.004)  |
| 18.period#1.art_treat (ref = NC) | 0.002   | 0.008*** |
|           | (0.002)  | (0.002)  |
| 18.period#2.art_treat (ref = NC) | 0.013*** | 0.020*** |
|           | (0.004)  | (0.004)  |
| 19.period#1.art_treat (ref = NC) | 0.001   | 0.007*** |
|           | (0.002)  | (0.002)  |
| 19.period#2.art_treat (ref = NC) | 0.015*** | 0.022*** |
|           | (0.004)  | (0.004)  |
| 20.period#1.art_treat (ref = NC) | -0.002  | 0.005*** |
|           | (0.002)  | (0.002)  |
| 20.period#2.art_treat (ref = NC) | 0.011*** | 0.018*** |
|           | (0.004)  | (0.004)  |
| 21.period#1.art_treat (ref = NC) | -0.002  | 0.004**  |
|           | (0.002)  | (0.002)  |
| 21.period#2.art_treat (ref = NC) | 0.012*** | 0.018*** |
|           | (0.004)  | (0.004)  |
| 22.period#1.art_treat (ref = NC) | -0.005*** | 0.001 |
|           | (0.002)  | (0.002)  |
| 22.period#2.art_treat (ref = NC) | 0.012*** | 0.017*** |
|           | (0.004)  | (0.004)  |
| 23.period#1.art_treat (ref = NC) | -0.006*** | -0.001 |
|           | (0.002)  | (0.002)  |
| 23.period#2.art_treat (ref = NC) | 0.013*** | 0.018*** |
|           | (0.004)  | (0.004)  |
| 24.period#1.art_treat (ref = NC) | -0.007*** | -0.003* |
|           | (0.002)  | (0.002)  |
| 24.period#2.art_treat (ref = NC) | 0.016*** | 0.020*** |
|           | (0.004)  | (0.004)  |
| 26.period#1.art_treat (ref = NC) | -0.009*** | -0.005*** |
|           | (0.002)  | (0.002)  |
| 26.period#2.art_treat (ref = NC) | 0.057*** | 0.060*** |
|           | (0.004)  | (0.004)  |
| 27.period#1.art_treat (ref = NC) | -0.004** | -0.001 |

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### TABLE 3A
Model (1) and Model (2) full estimation results (generalized estimating equation linear models) (continued)

| VARIABLES                      | Model (1)        | Model (2)        |
|-------------------------------|-----------------|-----------------|
| 27. period#2.art_treat (ref= NC) | 0.064***        | 0.067***        |
|                               | (0.004)         | (0.004)         |
| 28. period#1.art_treat (ref= NC) | -0.003**        | -0.000          |
|                               | (0.002)         | (0.002)         |
| 28. period#2.art_treat (ref= NC) | 0.052***        | 0.055***        |
|                               | (0.004)         | (0.004)         |
| 29. period#1.art_treat (ref= NC) | -0.002          | 0.001           |
|                               | (0.002)         | (0.002)         |
| 29. period#2.art_treat (ref= NC) | 0.049***        | 0.053***        |
|                               | (0.004)         | (0.004)         |
| 30. period#1.art_treat (ref= NC) | -0.003*         | -0.001          |
|                               | (0.002)         | (0.002)         |
| 30. period#2.art_treat (ref= NC) | 0.049***        | 0.051***        |
|                               | (0.004)         | (0.004)         |
| 31. period#1.art_treat (ref= NC) | -0.004**        | -0.001          |
|                               | (0.002)         | (0.002)         |
| 31. period#2.art_treat (ref= NC) | 0.049***        | 0.048***        |
|                               | (0.004)         | (0.004)         |
| 32. period#1.art_treat (ref= NC) | -0.002          | 0.001           |
|                               | (0.002)         | (0.002)         |
| 32. period#2.art_treat (ref= NC) | 0.047***        | 0.044***        |
|                               | (0.004)         | (0.004)         |
| 33. period#1.art_treat (ref= NC) | -0.000          | 0.003           |
|                               | (0.002)         | (0.002)         |
| 33. period#2.art_treat (ref= NC) | 0.048***        | 0.044***        |
|                               | (0.004)         | (0.004)         |
| 34. period#1.art_treat (ref= NC) | 0.002           | 0.005**         |
|                               | (0.002)         | (0.002)         |
| 34. period#2.art_treat (ref= NC) | 0.043***        | 0.038***        |
|                               | (0.004)         | (0.004)         |
| 35. period#1.art_treat (ref= NC) | 0.002           | 0.006***        |
|                               | (0.002)         | (0.002)         |
| 35. period#2.art_treat (ref= NC) | 0.039***        | 0.033***        |
|                               | (0.004)         | (0.004)         |
| 36. period#1.art_treat (ref= NC) | 0.002           | 0.006***        |
|                               | (0.002)         | (0.002)         |
| 36. period#2.art_treat (ref= NC) | 0.048***        | 0.041***        |
|                               | (0.004)         | (0.004)         |

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### TABLE 3A

Model (1) and Model (2) full estimation results (generalized estimating equation linear models) (continued)

| VARIABLES                        | Model (1) | Model (2) |
|----------------------------------|-----------|-----------|
| 37.period#1.art_treat (ref = NC) | 0.003     | 0.006***  |
|                                  | (0.002)   | (0.002)   |
| 37.period#2.art_treat (ref = NC) | 0.045***  | 0.038***  |
|                                  | (0.004)   | (0.004)   |
| 38.period#1.art_treat (ref = NC) | 0.003     | 0.007***  |
|                                  | (0.002)   | (0.002)   |
| 38.period#2.art_treat (ref = NC) | 0.041***  | 0.033***  |
|                                  | (0.004)   | (0.004)   |
| 39.period#1.art_treat (ref = NC) | 0.003     | 0.007***  |
|                                  | (0.002)   | (0.002)   |
| 39.period#2.art_treat (ref = NC) | 0.040***  | 0.031***  |
|                                  | (0.004)   | (0.004)   |
| 40.period#1.art_treat (ref = NC) | 0.006***  | 0.010***  |
|                                  | (0.002)   | (0.002)   |
| 40.period#2.art_treat (ref = NC) | 0.046***  | 0.038***  |
|                                  | (0.005)   | (0.005)   |
| 41.period#1.art_treat (ref = NC) | 0.009***  | 0.012***  |
|                                  | (0.002)   | (0.002)   |
| 41.period#2.art_treat (ref = NC) | 0.048***  | 0.039***  |
|                                  | (0.005)   | (0.005)   |
| 42.period#1.art_treat (ref = NC) | 0.008***  | 0.010***  |
|                                  | (0.002)   | (0.002)   |
| 42.period#2.art_treat (ref = NC) | 0.048***  | 0.040***  |
|                                  | (0.005)   | (0.005)   |
| 43.period#1.art_treat (ref = NC) | 0.009***  | 0.012***  |
|                                  | (0.003)   | (0.003)   |
| 43.period#2.art_treat (ref = NC) | 0.049***  | 0.041***  |
|                                  | (0.005)   | (0.005)   |
| 44.period#1.art_treat (ref = NC) | 0.009***  | 0.013***  |
|                                  | (0.003)   | (0.003)   |
| 44.period#2.art_treat (ref = NC) | 0.049***  | 0.042***  |
|                                  | (0.005)   | (0.005)   |
| 45.period#1.art_treat (ref = NC) | 0.012***  | 0.016***  |
|                                  | (0.003)   | (0.003)   |
| 45.period#2.art_treat (ref = NC) | 0.047***  | 0.040***  |
|                                  | (0.005)   | (0.005)   |
| 46.period#1.art_treat (ref = NC) | 0.010***  | 0.015***  |
|                                  | (0.003)   | (0.003)   |
| 46.period#2.art_treat (ref = NC) | 0.049***  | 0.044***  |

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| VARIABLES | Model (1) | Model (2) |
|-----------|-----------|-----------|
|           | (0.005)   | (0.005)   |
| 47.period#1.art_treat (ref = NC) | 0.008***  | 0.013***  |
|           | (0.003)   | (0.003)   |
| 47.period#2.art_treat (ref = NC) | 0.054***  | 0.048***  |
|           | (0.005)   | (0.005)   |
| 48.period#1.art_treat (ref = NC) | 0.007**   | 0.012***  |
|           | (0.003)   | (0.003)   |
| 48.period#2.art_treat (ref = NC) | 0.056***  | 0.051***  |
|           | (0.005)   | (0.005)   |
| 49.period#1.art_treat (ref = NC) | 0.005*    | 0.010***  |
|           | (0.003)   | (0.003)   |
| 49.period#2.art_treat (ref = NC) | 0.053***  | 0.048***  |
|           | (0.005)   | (0.005)   |
| Women's age | 0.002***  | 0.005***  |
|           | (0.000)   | (0.000)   |
| Women's age, squared | -0.000*** | -0.000*** |
|           | (0.000)   | (0.000)   |
| Reference Date between 2000-2005 (ref = 1995-2000) | 0.001*** |
|           | (0.000)   |           |
| Reference Date between 2005-2010 (ref = 1995-2000) | 0.022*** |
|           | (0.000)   |           |
| Reference Date after 2010 (ref = 1995-2000) | 0.026*** |
|           | (0.000)   |           |
| 3.Hospital District | 0.012***  |
|           | (0.003)   |           |
| 4.Hospital District | 0.009***  |
|           | (0.003)   |           |
| 5.Hospital District | 0.011***  |
|           | (0.003)   |           |
| 6.Hospital District | 0.011***  |
|           | (0.003)   |           |
| 7.Hospital District | 0.008***  |
|           | (0.003)   |           |
| 8.Hospital District | 0.007**   |
|           | (0.003)   |           |
| 9.Hospital District | 0.006**   |
|           | (0.003)   |           |

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| VARIABLES               | Model (1) | Model (2) |
|-------------------------|-----------|-----------|
| 10. Hospital District   | 0.006*    |           |
|                         | (0.003)   |           |
| 11. Hospital District   | 0.011***  |           |
|                         | (0.003)   |           |
| 12. Hospital District   | 0.010***  |           |
|                         | (0.003)   |           |
| 13. Hospital District   | 0.011***  |           |
|                         | (0.003)   |           |
| 14. Hospital District   | 0.007**   |           |
|                         | (0.003)   |           |
| 15. Hospital District   | 0.008***  |           |
|                         | (0.003)   |           |
| 16. Hospital District   | 0.005*    |           |
|                         | (0.003)   |           |
| 17. Hospital District   | 0.004     |           |
|                         | (0.003)   |           |
| 18. Hospital District   | 0.004     |           |
|                         | (0.003)   |           |
| 19. Hospital District   | 0.002     |           |
|                         | (0.003)   |           |
| 20. Hospital District   | 0.001     |           |
|                         | (0.003)   |           |
| 21. Hospital District   | 0.003     |           |
|                         | (0.003)   |           |
| 25. Hospital District   | 0.010***  |           |
|                         | (0.003)   |           |
| Household Income Decile 2 | 0.005*** |
|                         | (0.000)   |           |
| Household Income Decile 3 | 0.003*** |
|                         | (0.000)   |           |
| Household Income Decile 4 | 0.001**  |
|                         | (0.000)   |           |
| Household Income Decile 5 | -0.001** |
|                         | (0.000)   |           |
| Household Income Decile 6 | -0.002***|
|                         | (0.000)   |           |
| Household Income Decile 7 | -0.003***|
|                         | (0.000)   |           |
| Household Income Decile 8 | -0.004***|

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| VARIABLES                     | Model (1)     | Model (2)     |
|-------------------------------|---------------|---------------|
|                               | (0.000)       | (0.000)       |
| Household Income Decile = 9   | -0.004***     |               |
|                               | (0.000)       |               |
| Household Income Decile = 10  | -0.005***     |               |
|                               | (0.000)       |               |
| Second Birth                  | -0.021***     |               |
|                               | (0.000)       |               |
| Third+ Birth                  | -0.019***     |               |
|                               | (0.001)       |               |
| Partnership Status            | -0.021***     |               |
|                               | (0.000)       |               |
|                               | -0.040***     | -0.072***     |
|                               | (0.001)       | (0.003)       |
| Constant                      | 19,203,536    | 19,203,536    |
| Observations                  | 575,921       | 575,921       |
| Number of id                  | 0.001***      | -0.001***     |

Note: Standard errors in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1. Art_treat is a categorical variable that takes value 0 for women who conceived naturally, 1 for women who conceived through Medically Assisted Reproduction (MAR) treatments and 2 for women who remained childless after undergoing MAR treatments. Coefficients on the interaction between period and art_treat represent the probability of antidepressant use for women in the MAR+ and MAR- groups against women in the NC group. Second and Third+ birth are binary variables that take value one in the period a second or third and higher parity child is born and all period after that and 0 otherwise. Partnership status is a binary variable that takes value 1 if the woman is married or cohabiting in each 6 months period and 0 otherwise.

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## TABLE 4A
Psychotropic purchases before and after conception or last cycle date, by group and length of treatment

| Psychotropic purchases:                              | NC Mean (%) | MAR+ Mean (%) | MAR- Mean (%) | Total Mean (%) |
|------------------------------------------------------|-------------|---------------|---------------|---------------|
|                                                      | SD          | < 2 years     | >= 2 years    | < 2 years     | >= 2 years    | 2 years     |                      |
| Before conception or last cycle date                 | 14.48       | 35.19         | 16.87         | 37.45         | 23.64         | 42.49       | 21.08                   | 40.79         | 29.83                   | 45.76         | 14.98                   | 35.68         |
| After conception or last cycle date                  | 27.04       | 44.42         | 27.37         | 44.58         | 29.08         | 45.42       | 36.8                    | 49.23         | 39.26                   | 48.23         | 27.33                   | 44.57         |
| Before and/or after conception or last cycle date    | 32.93       | 47            | 34.86         | 47.65         | 39.24         | 48.83       | 43.03                   | 49.52         | 47.96                   | 49.96         | 33.4                    | 47.16         |
| N of observations                                    | 528,913     | 23,983        | 9,959         | 7,220         | 5,846         | 575,921     |                                          |

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