

The Profile and Economic Resources of Single Mothers Who Conceived Using Assisted Reproduction (Working Paper)

Denise B. Musni

Centre for Demographic Research (DEMO) – Université catholique de Louvain

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Abstract

Background. Single women are increasingly having children via medically assisted reproduction (MAR), yet large-scale evidence on their profiles and economic resources remains limited.

Objective. This paper examines the characteristics and pre-birth income of single MAR mothers, distinguishing between single mothers who did not identify a second parent for their child (SNP) and those who did (SWP).

Methods. Using Belgian birth records, population registers, and tax declarations, the study analyzes a sample of over 40 thousand mothers who had a first child conceived with the help of MAR. Multinomial logistic regression estimates the relationship between income and the likelihood of becoming a single mother via MAR, relative to being partnered.

Results. From 2010-2019, an average of 418 firstborn children each year were delivered by single mothers who used MAR. SNP mothers (5% of the sample) were the oldest among MAR mothers, and personal income was positively associated with belonging to this group. SWP mothers (4% of MAR mothers) formed a more heterogeneous group, with both low and very high income increasing the likelihood of being in this category.

Conclusions. SNP motherhood appears linked to greater financial resources. SWP motherhood appears to encompass diverse situations, including recent partnership dissolutions with previous resource-sharing, or elective co-parenting arrangements where single women still carried most of the financial responsibility.

Contribution. This study provides new insights on the diversity of situations surrounding single motherhood and the resources associated with alternative paths to parenthood.

Keywords. single motherhood, singlehood, medically assisted reproduction, fertility postponement, family formation, economic resources, income, Belgium, register data

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1 Introduction

All over the world, women are having children later in life. In European countries, women's mean age at childbirth rose from 29.0 in 2001 to 31.2 in 2023 (Eurostat, 2025). Perceived ideal ages and age limits for childbearing have also shifted upward (Lazzari et al., 2024). Moreover, the share of births to women in “advanced maternal age” (35+) in the European Union rose from 15.5% in 2001 to 27.1% in 2021 (World Health Organization, 2024). Linked to these trends, medically assisted reproduction (MAR)¹ has been growing in popularity among couples and individuals facing declining fecundity due to advancing age.

The narrowing reproductive window in later reproductive ages was also a key consideration for a small but growing number of single women who pursued parenthood as “solo mothers,” often via MAR (Golombok, 2015; Jadva et al., 2009; Zamora-Martínez et al., 2025). However, large-scale studies on single women who undergo MAR treatments remain rare primarily due to lack of representative data (e.g., Finland: Pelikh et al., 2023, 2025). While existing research shows that those who conceive via MAR are typically more socioeconomically advantaged than those who conceive spontaneously (Choi et al., 2022; Goisis et al., 2020), we know little about resource inequalities among MAR users, particularly among partnered and single individuals.

. Single women who conceived via MAR may have required greater financial resources before pursuing motherhood, given their lack of a partner to share the costs of treatments and childrearing with. On the other hand, women may conceive via MAR within a partnership but deliver their child while single. Women may also conceive with a second parent but not be in

¹ MAR covers a wide range of interventions to treat infertility such as hormonal treatments and assisted insemination, as well as more invasive assisted reproductive technologies including in-vitro fertilization (IVF) and intracytoplasmic sperm injection (ICSI).

a relationship with them (“elective co-parenting”). In the latter two cases, women’s access to parenthood may have relied on shared resources with their ex-partner or co-parent.

Considering the above, this study combines Belgian birth records and fiscal data to examine the profiles and economic resources of single mothers who conceived with the help of MAR (here, “single MAR mothers”), compared to partnered MAR mothers. This study distinguishes between single women who did not identify a second parent for their child (Single, No Second Parent / SNP) and those who did (Single, With Second Parent / SWP). SNP mothers likely include women who intended to conceive alone, whereas SWP mothers may reflect partnership dissolution closer to the birth or elective co-parenting. This distinction among single mothers is a key contribution of this study, as it allows us to examine how differences in partnership context relate to pre-parenthood resources. Restricting the analysis to MAR mothers yields a sample of women who all intended to conceive and had access to fertility treatments, allowing us to focus on differences linked to their partnership status and resources. This study also contributes one of the first register-based analyses on the heterogeneity of single MAR mothers.

2 Single MAR mothers’ partnership situations

Studies, mostly from rich countries, have documented a rise in the number of “solo mothers” who decided to have a child without a partner, amidst their declining fecundity (Golombok, 2015; Jadva et al., 2009; Van Gasse & Mortelmans, 2020; Volgsten & Schmidt, 2021; Zamora-Martínez et al., 2025). Literature mentions that while these women are “mother’s by choice,” they are “single by circumstance” (Jadva et al., 2009). In a register-based study in Finland, nearly 11% of women who underwent MAR treatments for the first time did

so without a partner, but nearly half of these women cohabited with a partner at least once in the past (Pelikh et al., 2023). Aligning with qualitative research, this suggests that solo motherhood is regarded as a Plan B after not being able to build a family with the right partner.

In most cases, solo mothers conceive with the help of donor sperm. Many solo mothers chose to conceive with an anonymous donor, as it simplified the process and was viewed to prevent the biological father from claiming parentage and interfering in the child's upbringing (Jadva et al., 2009; Van Gasse & Mortelmans, 2020). Studies have consistently observed that women who become single mothers in this way are highly educated and with stable employment, reflecting not only high agency, but also their economic ability to raise a child independently.

On the other hand, women looking for alternative ways to fulfil their fertility intentions may also decide to conceive and raise a child with an acquaintance or friend, without being in a relationship with them, referred to as elective co-parenting (Bower-Brown et al., 2024) or PACT (Pre-conception Agreement-based Co-parenting Together-apart) (Decappelle et al., 2025). If no romantic partnership is envisioned, assisted reproduction is also a comfortable way to conceive among intended co-parents. This emerging family arrangement may take different configurations, such as a single heterosexual woman conceiving with a homosexual man (Segal-Engelchin et al., 2005). Unlike solo mothers, elective co-parents thought it important that their child grows up knowing their biological father, and expect the biological father to also be present in childrearing (Bower-Brown et al., 2024; Jadva et al., 2015; Segal-Engelchin et al., 2012). In some cases, involving a co-parent was also seen as a way to share the financial and practical aspects of raising a child (Segal-Engelchin et al., 2012).

Of course, a woman delivering a child while single may also simply reflect a breakup with a partner shortly before birth. Unions dissolve for a myriad of reasons. For instance,

infertility and the stress of undergoing MAR treatments have been found to be linked to a decline in the mental health for both partners (Tosi & Goisis, 2021), and this may contribute to the breakdown of a relationship. It must be noted, however that studies find successful conception to be linked to improvement in mental health (Tosi & Goisis, 2021) as well as lower risk of couples' separation compared to couples who underwent MAR but remained childless (Pelikh et al., 2024).

3 Differences in MAR mothers' economic resources

The high costs of assisted reproduction treatments, time-consuming procedures, and modest success rates create barriers to accessing MAR. As a result, those who are able to conceive with the help of MAR come mostly from advantaged backgrounds, even in contexts where treatments are largely subsidized (Goisis et al., 2020). However, the role that one's own resources play in accessing MAR differs according to their partnership context.

For women in a couple, access to MAR may be defined by pooled resources with her partner, not just her own. This resource-sharing is particularly important in contexts where gendered role-specialization within (heterosexual) couples (Becker, 1991), often accompanied by women's reduction of work hours or exits from the labor force, leads to lower earnings for women compared to their partner (European Institute for Gender Equality, 2024).

In contrast, women who intend to be solo mothers may anticipate covering most of the costs of bearing and raising a child. Hence, they may ensure that they have sufficient financial resources before undergoing the MAR journey. While enlisting the support of family and friends is also crucial for women who intended to be single mothers, preparations related to housing, social services, and adjustment of work hours would still require sufficient personal

financial resources (Van Gasse & Mortelmans, 2020). Alternatively, single women who have reached a certain level of income may be more confident to begin motherhood on their own. Following this argument, a register-based study in Belgium found high income to be positively associated with having a first child among highly-educated single women aged 35 and older (Musni & Schnor, 2025).

Although register data does not capture intention to conceive while single, the combination of MAR use, being single at birth, and not identifying a second parent plausibly captures a subset of women who became solo mothers. Personal income is thus expected to be important for this group, and *high pre-birth income is hypothesized to increase the likelihood of being a SNP mother, relative to being partnered (H1)*.

The link between economic resources and single MAR mothers who separated or chose non-romantic co-parenting is more difficult to theorize. In both cases, access to assisted reproduction may have been through pooling resources with the second parent, but the extent of resource-sharing may be quite varied. There is reason to hypothesize, however, that elective co-parents may have greater economic resources than partnered mothers. Previous qualitative work has shown that women were more involved in planning entry into this type of parenthood than their co-parents (Jadva et al., 2015), and that mothers were still more likely to be the primary caregivers for their child (Bower-Brown et al., 2024). However, register data does not allow for a clear further distinction among single mothers who identified a second parent for their child. Considering the potential diversity of situations, *pre-birth income is hypothesized to have little association with being a SWP mother rather than partnered, though a slight positive association may exist (H2)*.

3 Single women's MAR access in Belgium

MAR policies in Belgium have been described as “liberal” (Sosson & Malmanche, 2020). All women below 48, regardless of sexual orientation or union status, have access to fertility treatments in Belgium. Although the country's first MAR law was only enacted in 2007, fertility clinics have been serving single clientele since the beginnings of MAR in the 1980s. Single women may choose to conceive with donor sperm, in which case, the identity of the donor will be anonymous,² but they may also conceive with the sperm of an acquaintance. Since 2003, for women affiliated with a Belgian health insurance provider, up to 80% of costs of six cycles of artificial insemination, IVF, or ICSI are subsidized if they occur before their 43rd birthday. While costs vary per clinic, a provider in Brussels estimates that covered patients pay from 500 to 700 EUR per IVF cycle (Brussels IVF, 2025). Women and couples using donor sperm, however, do not get reimbursed for the costs of donor material, which may be from 400 to 500 EUR per straw. Egg-freezing for non-medical reasons, which can cost around 3,000 EUR, is also fully shouldered by the patient,

Except for legal age limits, clinics are given full autonomy over their selection criteria for women wanting to be “solo mothers.” Discussions with practitioners suggest that selection practices vary greatly—some clinics refuse to treat single women altogether, others have a minimum age requirement, some employ a pre-screening questionnaire before inviting women to have a first consultation, a few clinics hardly ever reject solo mother applicants. In deciding who to accept for treatment, clinics often have to balance their duty to help women conceive, with a responsibility to ensure that the future child will grow up in good conditions (Hertogs et al., 2021; Van Gasse & Mortelmans, 2020). Individual fertility practitioners have their own

² In September 2024, the Constitutional Court decreed that donor anonymity is non-constitutional. A revision of the law is mandated to occur before 2027.

ideas on what it takes to be a good mother, and may, for instance, favor women with a stable source of income or a strong social support network (Hertogs et al., 2021). Despite the variety of selection procedures, there appears to be a constant demand for MAR from single women. From 2019 to 2022, an average of 2,800 in-clinic inseminations were performed on single women in Belgium, representing between 32% to 35% of inseminations via donor sperm each year (College of Physicians of Reproductive Medicine, 2021, 2022, 2023, 2025). Belgian fertility clinics have also observed a recent increase in the number of unpartnered women seeking fertility treatments, and from increasingly varied ages (Moller-Nielsen, 2023; Torfs, 2022).

4 Data and methods

4.1 Data and analytic sample

Data comes from anonymized Belgian birth records (2010 to 2019) linked to national registers (DEMOBEL) and tax declarations (IPCAL) (2009 to 2018) (Directorate-general Statistics – Statistics Belgium, 2021a, 2021b, 2021c). The dataset included children born in Belgium to legal resident mothers, the child's registered parents, and other members of the child's household. The final study sample included 42,083 women who had a first child in Belgium following MAR treatments.

Belgian birth records are an interesting source of medical data on live births, as well as socioeconomic information on the child's parents. Since 2010, the birth records also identify how each child was conceived (spontaneous conception, hormonal treatments, ICSI, IVF, unknown), either through medical records from fertility clinics in Belgium or upon declaration

of the parents. The conception variable, however, does not include intra-uterine insemination. While hormonal stimulation may precede insemination, it is not always a prerequisite.

The analytic sample was formed by initially taking all first births conceived via MAR (hormonal treatments, IVF/ICSI) during the study period (42,830 out of 1,214,474 births). Then, observations where the mother's identifier could not be matched with information in the national register, or where the mother had unknown union status (42,311 remaining) were dropped. In cases of multiple births, only one observation was retained. Hence, each mother appears only once in the dataset (42,237 remaining). Next, the sample was restricted to women who were at least 20 years old at the time of their first childbirth (42,203 remaining). Lastly, the sample excludes cases where the mother in the birth record is not identified as the child's parent in the national register, suggesting possible cases of surrogacy or adoption.³

4.2 Measures

The **dependent variable** for this study is the type of MAR mother according to women's union status and the identification of a second parent for her child: (1) partnered, (2) single with no second parent identified (SNP), and single with an identified second parent (SWP).

Birth records identify whether mothers were in a union (here referred to as partnered) or outside a union (here referred to as single) at the time of the child's birth. Partnered mothers were either married or were in legal or de facto cohabitation with a partner of either sex.⁴ Parents of the child may declare their union status around the time of birth registration, but

³ The woman who gives birth to a child is automatically identified as the mother of the child in the Belgian birth records, but a different set of parents may be registered legally.

⁴ Same-sex legal cohabitation was legalized in Belgium in 2000, and same-sex marriage in 2003.

information in the national registers may also be used to correct what was provided. For instance, if a mother declares to be single but is still married according to the national registers, she will be identified as being partnered in the birth records.

In this study, the identification of a second parent is treated as a proxy for availability of additional social support, particularly for single women. It is possible to identify up to two parents in the birth records. If the mother of the child is married, the identified second parent will automatically be her spouse. In cases when the birth mother went through Belgian clinics to conceive with a known person, such as her partner or an elective co-parent, the latter will be identified as the child's second parent. The second parent is not automatically identified if a child was conceived outside of marriage. To claim parenthood in such cases, the intended second parent would have to declare parenthood at the civil registry prior to the birth of his/her child, accompanied by the birth mother.

Before 2015, it was not possible for a second mother to be identified as a parent in the birth records. This limitation is mitigated for mothers with a female partner, as they are still likely to be reflected as cohabiting or married even if their partner is not their child's parent in the birth records. However, this means that former same-sex partners will not be listed as a second parent prior to 2015.

It is important to note that the data used reflects filiation as reflected in the birth records, around the time of the child's birth. Legal parenthood may be changed over time.

The main **independent variable** is the woman's annual personal income two years prior to birth: low (<15,000 EUR), average (15,000 EUR to <25,000 EUR), above-average (25,000 EUR to <30,000 EUR), higher (30,000 to <45,000), highest (45,000 EUR and above), and unknown. I used a lagged value of income to capture women's financial situations prior to

fertility treatments and childbirth, assuming that most of them began treatments within the two years preceding birth.

Income data comes from tax declarations, which reflect individuals' net taxable income revenue from professional activities, properties, taxable social security transfers, and other miscellaneous sources. Originally in 5,000 EUR intervals (e.g., 0 to <5000, 5000 to <10000, etc.), the income variable was recoded into six categories. I first identified the "average income" range, which covered the average annual personal income in Belgium for the period analyzed⁵ (*Statbel Datasets: Fiscal Statistics on Income (2010-2019)*, n.d.). Women with income falling below this threshold were categorized as having "low income." For the next income categories, ranges that constitute substantial proportions of the sample were grouped together. Women with income between 25,000 EUR and <30,000 EUR already formed 19% of the sample, hence were classified as having "above average income." Women who earned 30,000 EUR to <45,000 EUR (25% of the sample) were grouped into the "higher income" category. Finally, the "highest income" category covered 7% of the sample. Grouping income into these broad categories helps to reduce the impacts of shifts in values caused by inflation and thus allows more stable comparisons over time.

Controls. The models were controlled for mothers' age at the time of birth (<30, 30 to 34, 35 to 40, 40+), her educational attainment (primary, secondary, short-tertiary, long-tertiary), and the place where she was born (Belgium, Other Europe, Other).

⁵ 15,630 EUR in 2010 to 19,105 EUR in 2019

4.3 Analytic strategy

I first described the trends in first births from 2010 to 2019, according to the mothers' mode of conception and union status ($N = 503,458$). Then, I compared the socioeconomic profiles of MAR mothers and their household situations at the beginning of the birth year ($N = 42,083$). The latter variable gives an indication of the social support available to (single) mothers around the time of birth. Of course, household composition may have changed closer to the birth, and single mothers may have also received social support from people they were not cohabiting with. Yet because of the restrictions in the database, it was not possible to observe whether mothers were living close to their own parents or their partners around the time of childbirth. Household situation was excluded from the multivariate analysis because of its correlation with partner status. For SWP mothers, I also described co-residence trajectories with the identified second parent from two years before to two years after birth.

Multinomial logistic regression estimated the likelihood of being a single MAR mother (SNP or SWP), relative to being partnered, according to pre-birth personal income, and net of socioeconomic characteristics. Further analyses were also conducted and detailed in the appendices.

Analyses were performed in R version 4.5.2, using packages *nnet*, *parameters*, and *marginalEffects* for the multivariate analyses and *ggplot2* for the figures.

5 Results

5.1 MAR and partnership status: overall trends and patterns

From 2010 to 2019, some 8% of first births ($N = 503,458$) were conceived via MAR, with their numbers and shares increased during this period (Table A1 and A2). Less than 1% of all first births were to single women who conceived via MAR, yielding an average of 418 births per year.

MAR mothers are typically older compared to women who conceived spontaneously. Among partnered mothers, MAR conceivers were on average 32 years old around the time of first childbirth, while spontaneous conceivers were 29. This gap likely reflects delayed childbearing among MAR mothers, following unsuccessful attempts to conceive spontaneously. Single MAR mothers, on the other hand, were 35 years old on average, while their counterparts with a spontaneous conception were 27 years old at the time of childbirth. This larger contrast likely reflects differences in these groups' composition. Single MAR mothers may have used assisted reproduction after being unable to form a family with a partner earlier in life. Meanwhile, single women who spontaneously conceived may have had less-intended pregnancies at relatively younger ages.

Among MAR mothers ($N = 42,083$), most were partnered, 5% were single with no identified second parent (SNP), while 4% were single with a second parent (SWP). The share of single mothers who conceived via MAR increased over time (Figure 1), with the share of SNP mothers rising sharply after 2015. A potential contributor to this peak is the 2016 revision of the law governing MAR, which standardized, and may have in practice extended, the ages at which women may access fertility treatments.⁶ As single women pursuing parenthood

⁶ In 2016, the wording of age restrictions on women's access to MAR was revised. For gamete retrieval, the phrase "aged 45 years maximum" was replaced by "until the day before their 46th birthday." For embryo transfer and

independently tend to be in later reproductive ages, this revision may have benefitted them more than partnered women.

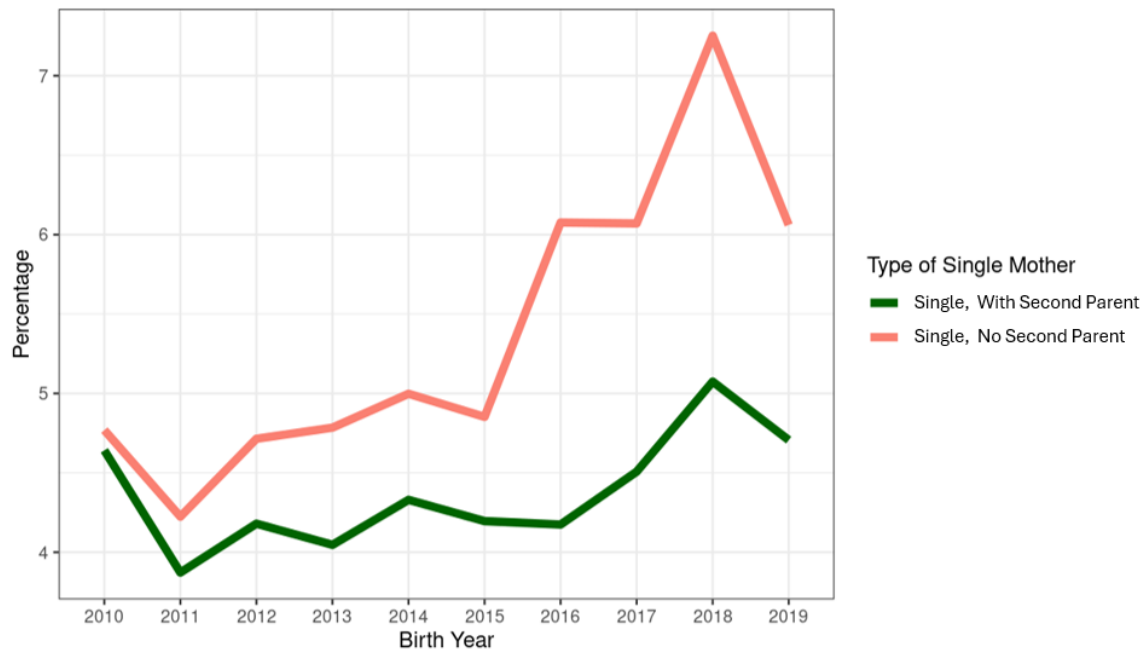


Figure 1. Share of single MAR mothers among all MAR mothers, 2010-2019

5.2 Characteristics, household situations, and pre-birth income of MAR mothers

Demographic characteristics

The three types of MAR mothers have different socioeconomic profiles (Table 1). In terms of age at first childbirth, partnered MAR mothers were the youngest (mean age: 32), and SNP mothers were the oldest (mean age: 36). Two out of three SNP mothers were 35 and above when they had their first child. Single mothers with an identified second parent have a relatively more even distribution in terms of age.

gamete insemination, the phrase “cannot be performed for adult women over 47” was replaced by “can be performed for adult women until the day before their 48th birthday.” This may have, in practice, slightly extended access to MAR for older women by standardizing how age cutoffs were interpreted.

SNP mothers had the highest share of tertiary-educated women (62%; long-tertiary educated: 26%), while SWP mothers had the lowest (42%; long-tertiary educated: 19%). About 80% of all MAR mothers had been born in Belgium, with the SNP category having the largest share of Belgian-born women (85%). Close to 70% of MAR mothers used IVF/ICSI rather than hormonal treatments (Table 1).

Table 1

Characteristics of MAR mothers, according to type

Characteristics	Partnered		Single, No Second Parent		Single, W/ Second Parent		Total	
	n	%	n	%	n	%	n	%
Type of MAR mother	37,971	90.2	2,271	5.4	1,841	4.4	42,083	100
Age at birth								
< 30	12,948	39.1	249	11.0	580	31.5	13,777	32.7
30 - 34	14,844	34.1	531	23.4	501	27.2	15,876	37.7
35 - 39	7,431	19.6	865	38.1	442	24.0	8,738	20.8
40 +	2,748	7.2	626	27.6	318	17.3	3,692	8.8
Mean age at birth	31.8		36.2		33.1		32.1	
Education								
Primary	2,457	6.5	126	5.5	218	11.8	2,801	6.7
Secondary	11,217	29.5	561	24.7	621	33.7	12,399	29.5
Tertiary-Short	12,154	32.0	814	35.8	420	22.8	13,388	31.8
Tertiary-Long	8,912	23.5	590	26.0	347	18.8	9,849	23.4
Unknown	3,231	8.5	180	7.9	235	12.8	3,646	8.7
Woman's country of birth								
Belgium	30,184	79.5	1,935	85.2	1,330	72.2	33,449	79.5
Other Europe	3,884	10.2	193	8.5	255	13.9	4,332	10.3
Other country	3,903	10.3	143	6.3	256	13.9	4,302	10.2
Technique used								
Hormones	11,695	30.8	764	33.6	486	26.4	12,945	30.8
IVF/ICSI	26,276	69.2	1,507	66.4	1,355	73.6	29,138	69.2
HH situation (beginning of birth year)								
Living alone	972	2.6	1,606	70.7	926	50.3	3,504	8.3
With partner	33,840	89.1	162	7.1	427	23.2	34,429	81.8
With parents	881	2.3	200	8.8	314	17.1	1,395	3.3
Other	2,074	5.5	296	13.0	137	7.4	2,507	6.0
Unknown	204	0.5	7	0.3	37	2.0	248	0.6

Pre-birth income								
Low (<15k)	6,691	17.6	204	9.0	454	24.7	7,249	17.5
Ave. (15k-<25k)	10,134	26.7	395	17.4	447	24.3	10,976	26.1
AAve. (25k-<30)	7,213	19.0	350	15.4	229	12.4	7,792	18.5
High (30k-<45k)	9,455	24.9	832	36.6	345	18.7	10,632	25.3
Highest (45k+)	2,491	6.6	339	14.9	146	7.9	2,976	7.1
Unknown	1,987	5.2	151	6.6	220	12.0	2,358	5.6
Total	37,971	100	2,271	100	1,841	100	42,083	100

Household situations

At the beginning of the birth year, 71% of SNP mothers and half of SWP mothers were living alone (Table 1). Meanwhile, some 1 in 5 single mothers with an identified second parent were living with a partner. Nearly 9% of SNP mothers and 17% of SWP mothers were co-residing with their own parents in the beginning of the birth year, signaling support-seeking in anticipation of single motherhood or following a separation.

A further analysis of SWP mothers' household trajectories reveal that a third of these mothers never co-resided with the second parent from two years before to two years after birth, while one in five moved in with the second parent after birth (Note A1 in the Appendix).

Annual pre-birth income

Clear income disparities emerge across MAR mother groups. More than half of SNP mothers (52%) had above-average pre-birth income, and 15% were in the highest income category. Meanwhile, one-in-four SWP mothers had low income before birth, and another quarter had average earnings. Median income was highest among SNP mothers (≈€30,000), and the lowest among single mothers with an identified second parent (≈€20,000). Within each MAR mother type, there are women with very low and very high income, but the variations appear greater within the SWP group.

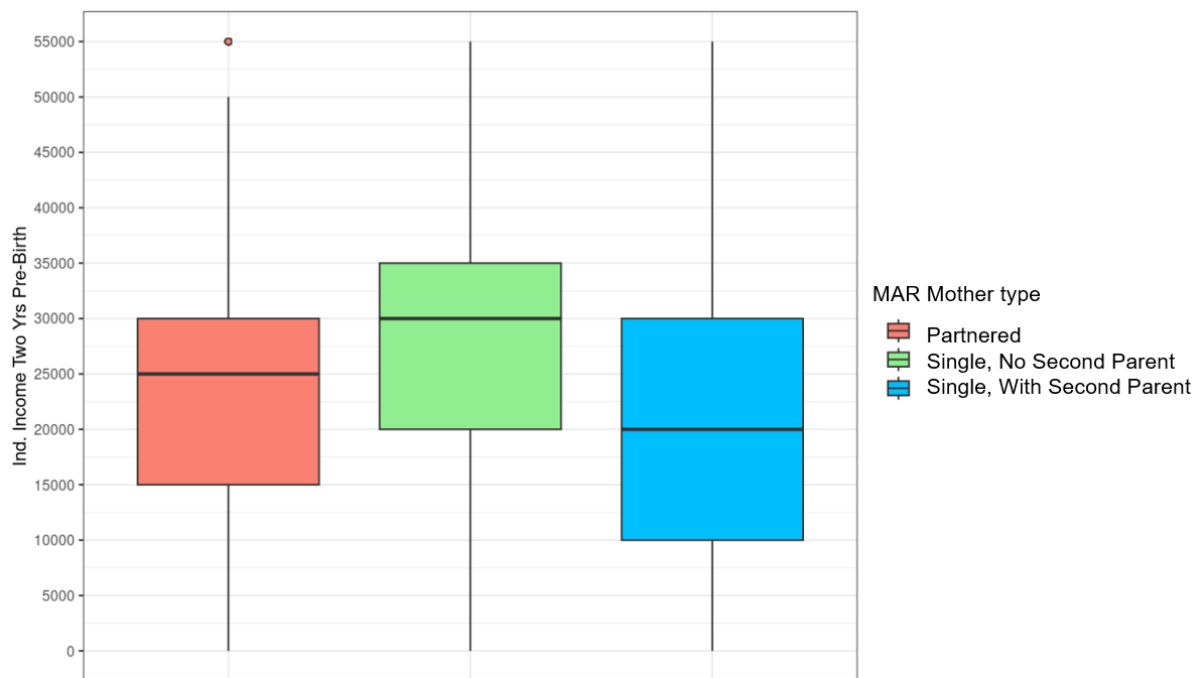


Figure 2. Pre-birth income distribution, by MAR mother type

5.3 Multivariate analysis

Pre-birth income and the likelihood of being a single MAR mother

Table 2 shows the results of multinomial logistic regression models expressed in Relative Risk Ratios. Results show a clear, positive association between pre-birth income and belonging to the SNP group, relative to being partnered. This association was attenuated but persisted after adjusting for controls. Compared to average earners, the highest-earning women had a much higher relative risk of being a single mother without a second parent than be partnered (Model 3, CI: 47% to 106%).

Table 2

Likelihood of being a single MAR mother compared to being partnered, according to pre-birth income and other socioeconomic characteristics

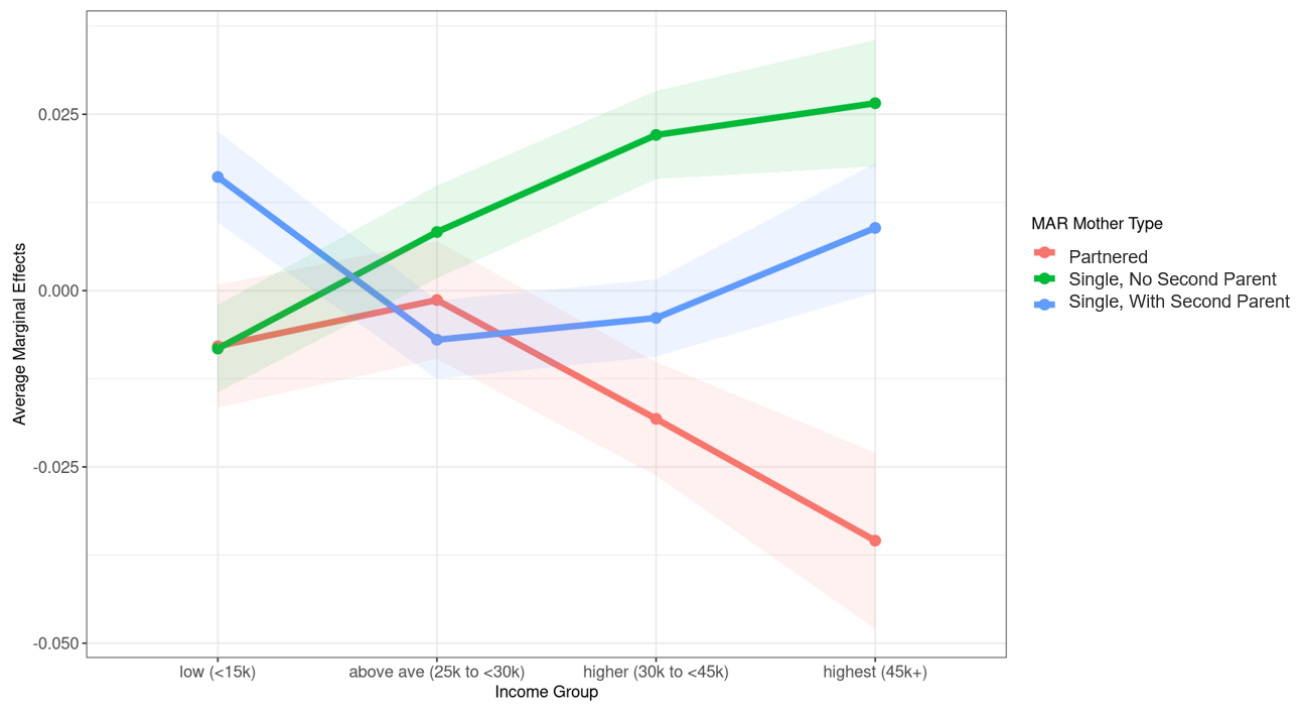
MAR Mother Type	Model 1			Model 2			Model 3			
	RRR	95% CI		RRR	95% CI		RRR	95% CI		
Partnered (Ref.).										
Single, No Second Parent	Income 2 Yrs. Before Birth									
	Low (<15k)	0.78	0.66	0.93	0.82	0.68	0.97	0.81	0.68	0.97
	Ave. (Ref.)									
	AAve. (25k-<30)	1.25	1.08	1.44	1.18	1.02	1.38	1.20	1.03	1.40
	High (30k-<45k)	2.26	2.00	2.55	1.50	1.32	1.71	1.58	1.38	1.81
	Highest (45k+)	3.49	3.00	4.07	1.54	1.31	1.81	1.74	1.47	2.06
	Unknown	1.95	1.60	2.36	1.73	1.39	2.15	1.84	1.48	2.29
	Age Group									
	<30				0.60	0.52	0.71	0.59	0.51	0.69
	30 to 34 (Ref.)									
	35 to 39				3.41	3.05	3.82	3.38	3.01	3.78
	40+				7.32	6.44	8.32	7.27	6.39	8.26
	Woman's Country of Birth									
	Belgium (Ref.)									
	Other-Europe									
					0.47	0.39	0.56	0.48	0.41	0.58
	Other									
					0.41	0.34	0.5	0.40	0.33	0.49
	Education									
	Primary									
								1.26	1.02	1.55
	Secondary									
	Tertiary-Short									
							1.04	0.92	1.17	
Tertiary-Long										
							0.80	0.70	0.91	
Unknown										
							0.99	0.82	1.18	
Intercept										
	0.04	0.04	0.04	0.03	0.03	0.04	0.03	0.03	0.04	
Single, W/ Second Parent	Income 2 Yrs. Before Birth									
	Low (<15k)	1.54	1.35	1.76	1.51	1.32	1.74	1.42	1.24	1.64
	Ave. (Ref.)									
	AAve. (25k-<30)_	0.72	0.61	0.85	0.73	0.62	0.86	0.83	0.70	0.97
	High (30k-<45k)	0.83	0.72	0.95	0.78	0.67	0.9	0.93	0.79	1.08
	Highest (45k+)	1.33	1.10	1.61	1.03	0.84	1.26	1.29	1.04	1.59
	Unknown	2.51	2.12	2.97	2.27	1.88	2.75	2.40	1.98	2.90
	Age Group									
	<30				1.19	1.05	1.35	1.14	1.01	1.3
	30 to 34 (Ref.)									
	35 to 39				1.66	1.46	1.9	1.65	1.44	1.88
	40+				2.98	2.56	3.47	2.99	2.57	3.48
	Woman's Country of Birth									
	Belgium (Ref.)									
	Other-Europe									
					0.84	0.71	0.98	0.82	0.70	0.97
	Other									
					0.84	0.71	0.98	0.73	0.63	0.86
	Education									
	Primary									
								1.42	1.20	1.68
	Secondary									
	Tertiary-Short									
							0.69	0.61	0.79	
Tertiary-Long										
							0.63	0.54	0.73	
Unknown										
							1.19	1.01	1.39	
Intercept										
	0.04	0.04	0.05	0.04	0.03	0.04	0.04	0.03	0.05	

Meanwhile, the relationship between income and belonging to the SWP group did not reveal a linear pattern. Compared to average earners, the lowest- and highest-earning women were more likely to be in this category than be partnered (Table 2). Low income was linked to a 24% to 64% higher relative risk of being a single mother with an identified second parent, while having the highest income increased this relative risk by 30% (CI: 4% to 59%).

The average marginal effects plot in Figure 3 better illustrates the positive relationship between income and belonging to the SNP group (green line), as well as the U-shaped relationship between income and belonging to the SWP group (blue line). High annual pre-birth income (€30,000 to €45,000+) increased the probability of being in the SNP group by 2 to 3 percentage points (Table A3). On the other hand, low income increased the probability of belonging to the SWP category by some 2 percentage points, while the highest income increased it by about 1 percentage point.

While the marginal effects appear small in absolute terms, they are meaningful, considering that the baseline predicted probability of being a single mother among average earners (the reference income category) was only 4% (Panel B, Figure 4; Table A4). Hence, even a 2-percentage point increase represents a relative increase of about 50% in the probability of being a single mother. It is unsurprising that women had the highest probability to be partnered across all income levels (Panel A, Figure 4), as this reflects the dominant partnership status in the sample.

A. Average Marginal Effects



B. Predicted Probabilities

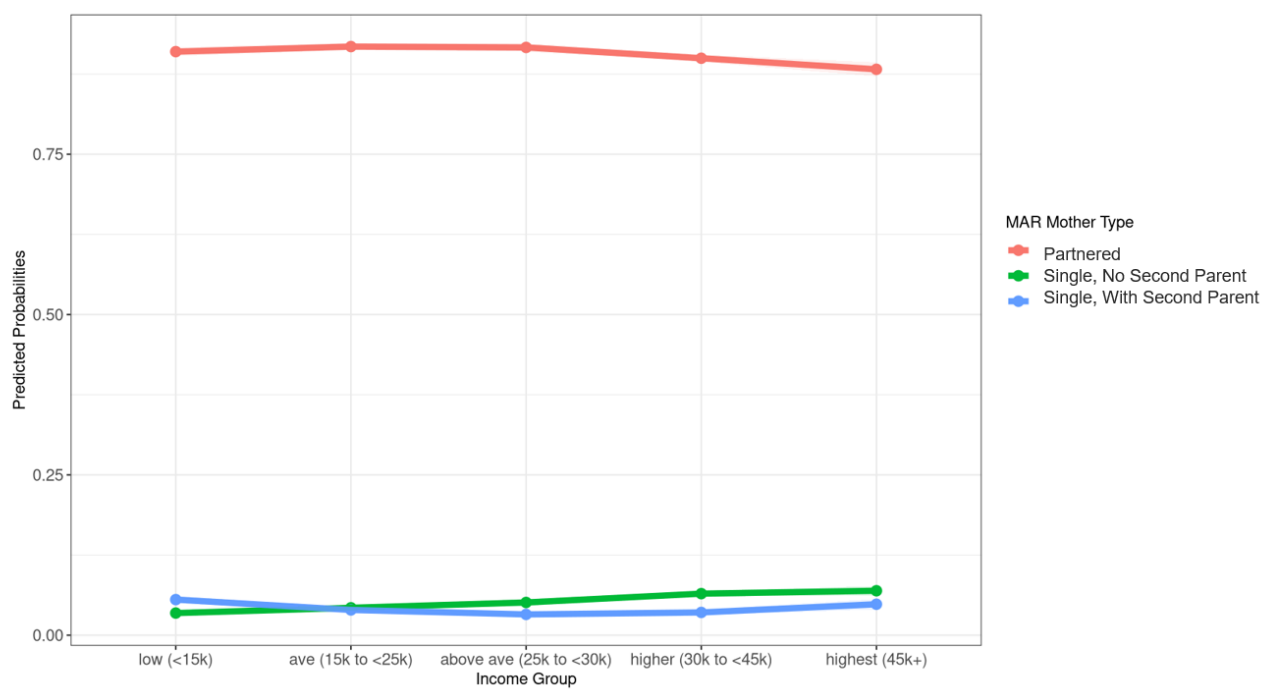


Figure 3. Likelihood of being a single or partnered MAR mother, according to pre-birth income

Controls

The controls included in the models (Table 2) also provide some interesting insights. Age was the strongest predictor of being a single mother versus being partnered. Women who were 40 and older, relative to being 30 to 34, were seven times more likely to be SNP mothers and thrice more likely to be SWP than be partnered.

Belgian-born mothers, relative to foreign-born women, were also more likely to be single than partnered. However, not much can be said about this difference, as the dataset does not capture non-resident women who received fertility treatments in Belgium but did not give birth in the country.

Compared to women with secondary education, those with low education had a 26% higher relative risk of being SNP mothers and a 42% higher risk of being SWP mothers than being partnered. These results may seem puzzling at first, especially for SNP mothers. Previous studies have portrayed intentional solo mothers to be highly educated, and the descriptive table shows relatively large shares of highly educated women in the SNP group. However, once other variables linked to educational attainment are controlled for (i.e., age and income), single MAR mothers no longer display a clear educational advantage over partnered MAR mothers. This pattern also reflects the composition of the partnered MAR mothers as the comparison group. Both access to MAR and being in a stable partnership are positively associated with higher education (Jalovaara & Andersson, 2023; Perelli-Harris & Lyons-Amos, 2016). Therefore, the partnered reference group is doubly selected towards higher education. On the other hand, single MAR mothers include a variety of partnership contexts, including separations, intended solo motherhood, and even elective co-parenting. Less stable partnership trajectories are, in contrast, more common among lower educated women. Hence, compared to partnered MAR

mothers who are selected toward higher education, lower education appears more associated with single MAR motherhood after controls are introduced.

Further analyses

Additional analyses interacting income and education assessed whether the relationship between income and MAR mother type differed by educational attainment. Results showed broadly similar relationships between income and the likelihood of belonging to one of the MAR mother groups across education levels, with wide and overlapping confidence intervals (Figure A1).

The same multivariate analysis was also performed using income one year before birth as the main dependent variable (Model 4, Table A5). Model 4 showed a positive relationship between income and being in the SNP group, with RRRs similar to that of Model 3. On the other hand, the relationship between income and being in the SWP group became less stable when using income one year before birth. While the direction of the associations between income and being an SWP mother remained the same as in Model 3, there were notable differences in estimates and statistical significance. This suggests that SWP mothers' income one year pre-birth reflects partnership shifts closer to the birthdate: women may increase their income following a partnership dissolution or reduce it upon greater involvement with the second parent.

6 Discussion and conclusion

In the context of the increasing use of assisted reproduction and increasing variety of ways to form families, this study provided rare population-level insight into the profiles and economic resources of single women who had their first child via MAR. These women represented a small but growing share of MAR mothers over the ten years observed. Distinguishing between single mothers who did not identify a second parent and those who did gives us insight into the heterogeneity of their partnership contexts. SNP mothers are likely those who have conceived without the involvement of a romantic partner. Meanwhile, SWP mothers appear to be a more heterogeneous group that may include women who experienced a breakup shortly before birth, or women who opted for elective co-parenting. These differences in partnership contexts were found to relate to variations in single mothers' pre-birth economic resources.

Single mothers with no identified second parent were older than other MAR mothers and a substantial share were highly educated, echoing the profile of intentional solo mothers (Golombok, 2015; Jadvá et al., 2009). It was hypothesized that high pre-birth income would increase the likelihood of being a SNP mother, relative to being partnered, and this was supported by the results. In the multivariate analysis, personal income was found to be positively associated with being single mother with no identified second parent. This suggests that having higher income opens pathways towards alternative ways to form a family, as argued by a study on older single women's fertility (Musni & Schnor, 2025). Despite the subsidization of fertility treatments in Belgium, access to MAR still involves significant co-payments and opportunity costs. This is particularly relevant for women who pursue motherhood at later ages, and might need to undergo multiple cycles of MAR treatments. This finding may also partly reflect selection by fertility clinics. Despite Belgium's liberal MAR policies, selection of

patients is ultimately at the hands of individual clinics. Some clinics may see single women's financial stability as a positive note when deciding on who they will accept for treatment. This positive income association could also reflect these women's ability to have treatments abroad. For women over 40, seeking treatments in countries with higher or non-existent age limits for MAR access may be a better option than attempting treatments in Belgium. Medical tourism for MAR has also been growing in popularity due to services that offer accommodation and tour packages combined with treatments in destinations such as Greece and Cyprus. Finally, economic resources may have also opened the possibility of the externalization of some aspects of childcare.

On the other hand, the SWP group appeared to be more heterogenous, likely because of the greater diversity of situations that could lead to being a single mother with an identified second parent. Household situations around the time of birth support this interpretation. A fourth of SWP mothers lived with the second parent at the beginning of the birth year, suggesting possible break-ups closer to childbirth. On the other hand, over one-third of SWP mothers did not co-reside with the second parent in the years surrounding birth, hinting at either elective co-parenting or living-apart-together arrangements. While there are limits in terms of what can be inferred with register data, these results nonetheless indicate the presence of newer family forms at the population level.

Pre-birth income was hypothesized to be only weakly linked with being a SWP mother, though a slight positive link was expected. The results partly support this hypothesis: a shallow U-shaped relationship between income and SWP motherhood was observed. Low pre-birth income was associated with a higher likelihood of being a SWP mother than being partnered, possibly reflecting prior reliance on an ex-partner's earnings. On the other hand, very high income was also found to be associated with an increase in the likelihood of being in this single mother group. This may echo the experiences of single women who decided to raise their child

with an elective co-parent, but who retained the primary responsibility for planning the conception and childrearing (Bower-Brown et al., 2024; Jadva et al., 2015).

Regardless of whether the intention to enter parenthood alone, single mothers strongly face the dual pressures of caring for a child while earning a sufficient income to support their family. These demands often compete for a parent's limited time. The results show that such difficulties are present even among a group of mothers who were fortunate enough to have accessed assisted reproduction. One in five SWP mothers had low income prior to childbirth. If these mothers faced recent separation, that would have also taken a toll on their financial stability (Fadel et al., 2025). Moreover, most single mothers in the sample were living alone prior to welcoming their first child, suggesting limited immediate support in the early days of parenthood. These realities remind us of the importance of public support measures for parents with young children. Among these: sufficient and affordable daycare and financial support for individuals facing economic hardship. It is important to keep highlighting the necessity of these measures, especially in light of planned reforms that may affect childcare availability and support in cases of unemployment (Belga, 2025; Gevers, 2025).

This study has several limitations. First, while the SNP mothers mirrored prior research on solo mothers, this category only captures the experiences of a subset of solo mothers, as assisted reproduction is not the only way to have a child alone. Moreover, with register data, it is not possible to determine with certainty the pre-birth situations that led to single motherhood. Also, birth records do not clearly distinguish intra-uterine insemination, and cases of self-insemination outside of clinics could not be identified. These latter limitations, which apply more to single women who looked for alternative ways to conceive, may have contributed to the higher age and resources of single MAR mothers in this study. Although the findings align with existing research on intentional solo mothers, greater differentiation of conception pathways in administrative records would strengthen future quantitative analyses of family

formation through assisted reproduction. Moreover, the present analysis only focused on economic resources as the data does not allow one to see how the availability of social resources (e.g., family or friends: Van Gasse & Mortelmans, 2020) relate to the likelihood of being a single MAR mother. Such questions may be better addressed by qualitative work. Researches with access to more complete registers may however examine whether single MAR mothers move closer to their own parents to have closer sources of support (e.g., mother-daughter dyads moving closer together close to birth: Rutigliano et al., 2023). Doing so was not possible with this dataset that only included individuals that have shared a residence with children in the birth records. Despite these limitations, this study was able to provide new quantitative insights on heterogeneity among single mother and the resources associated with alternative paths to parenthood.

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Appendices

Table A1. Number of first births per year, by union status and mode of conception

Year	All Births	MAR, Single	MAR, Partnered	Spontaneous, Single	Spontaneous, Partnered
2010	53,570	374	3,567	7,159	42,470
2011	52,841	331	3,692	6,891	41,927
2012	52,055	370	3,759	6,854	41,072
2013	50,825	381	3,847	6,740	39,857
2014	49,909	409	3,959	6,894	38,647
2015	49,544	389	3,905	6,998	38,252
2016	49,716	450	3,912	6,920	38,434
2017	49,034	475	4,000	6,782	37,777
2018	47,580	522	3,715	7,238	36,105
2019	47,411	476	3,901	6,688	36,346
Total	502,485	4,177	38,257	69,164	390,887

Table A2. Percentage of first births per year

Year	% MAR, Single	% MAR, Partnered	% Spontaneous, Single	% Spontaneous, Partnered
2010	0.7	6.7	13.4	79.3
2011	0.6	7.0	13.0	79.4
2012	0.7	7.2	13.2	78.9
2013	0.8	7.6	13.3	78.4
2014	0.8	7.9	13.8	77.4
2015	0.8	7.9	14.1	77.2
2016	0.9	7.9	13.9	77.3
2017	1.0	8.2	13.8	77.0
2018	1.1	7.8	15.2	75.9
2019	1.0	8.2	14.1	76.7
Overall	0.8	7.6	13.8	77.8

Note A1. Co-residence with the child's second parent among single mothers (SWP mothers)

In an attempt to better understand the SWP group, we used the population registers to describe SWP mothers' history of living in the same household as their child's second parent, two years before up to two years after the birth. We find that one in three SWP mothers (34%, $n = 1,841$) never lived with the child's second parent in the years surrounding the birth. One to two years after the year of birth, some 19% moved in with their child's second parent. A few moved away from the second parent after birth. Surprisingly, 13% of SWP mothers had always shared a household as their child's second parent, suggesting informal separations that may not have been reflected in the registers, temporary separations during the birth year, or perhaps even elective co-parenting. Due to missing household information, we could not see the living arrangements of 197 SWP mothers and their child's second parent (11%), possibly because of periods of living abroad for either one of these parents. These sequences suggest that this middle category is a significantly heterogeneous one.

Table A3. Average marginal effects of pre-birth income on the probability of being a MAR mother (Model 3)

MAR Mother Type	Pre-Birth Income	AME	95% CI	
Partnered	Low (<15k)	-0.008	-0.017	0.001
	Ave. (Ref.)			
	AAve. (25k-<30)	-0.001	-0.010	0.007
	High (30k-<45k)	-0.018	-0.026	-0.010
	Highest (45k+)	-0.035	-0.048	-0.023
	Unknown	-0.073	-0.090	-0.056
Single, No Second Parent	Low (<15k)	-0.008	-0.014	-0.002
	Ave. (Ref.)			
	AAve. (25k-<30)	0.008	0.002	0.015
	High (30k-<45k)	0.022	0.016	0.028
	Highest (45k+)	0.027	0.018	0.036
	Unknown	0.027	0.014	0.039
Single, W/ Second Parent	Low (<15k)	0.016	0.010	0.023
	Ave. (Ref.)			
	AAve. (25k-<30)	-0.007	-0.013	-0.001
	High (30k-<45k)	-0.004	-0.009	0.002
	Highest (45k+)	0.009	0.000	0.018
	Unknown	0.046	0.033	0.059

Table A4. Predicted probabilities of being a MAR mother, according to pre-birth income (Model 3)

MAR Mother Type	Pre-Birth Income	Predicted Probability	95% CI	
Partnered	Low (<15k)	0.91	0.90	0.92
	Ave. (15k-<25k)	0.92	0.91	0.92
	AAve. (25k-<30)	0.92	0.91	0.92
	High (30k-<45k)	0.90	0.89	0.91
	Highest (45k+)	0.88	0.87	0.89
	Unknown	0.85	0.83	0.86
Single, No Second Parent	Low (<15k)	0.03	0.03	0.04
	Ave. (15k-<25k)	0.04	0.04	0.05
	AAve. (25k-<30)	0.05	0.05	0.06
	High (30k-<45k)	0.06	0.06	0.07
	Highest (45k+)	0.07	0.06	0.08
	Unknown	0.07	0.06	0.08
Single, W/ Second Parent	Low (<15k)	0.06	0.05	0.06
	Ave. (15k-<25k)	0.04	0.04	0.04
	AAve. (25k-<30)	0.03	0.03	0.04
	High (30k-<45k)	0.04	0.03	0.04
	Highest (45k+)	0.05	0.04	0.06
	Unknown	0.09	0.07	0.10

Profile and Resources of Single MAR Mothers

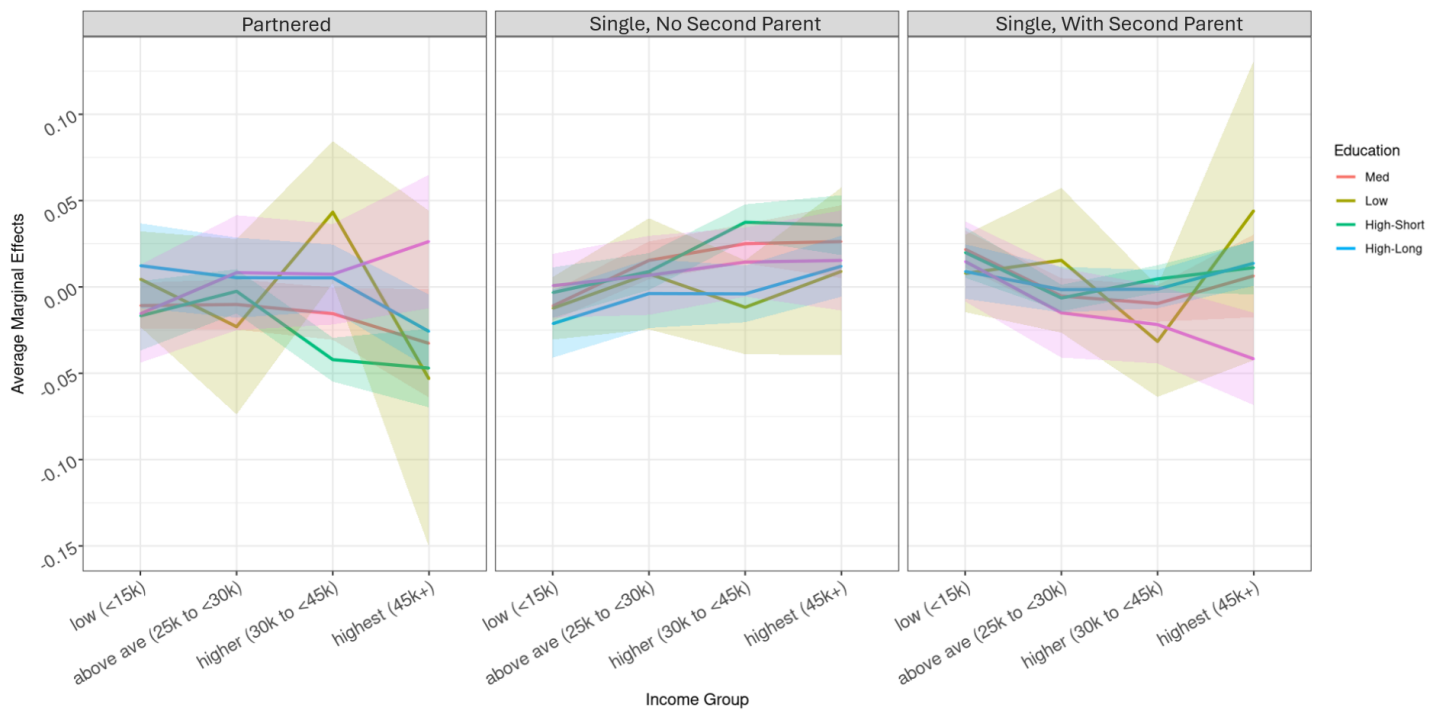


Figure A1. Average marginal effects of the interaction between pre-birth income and education on the probability of being a MAR mother

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