



Decomposing fertility rates – how are changing relationship patterns and increasing singlehood contributing to fertility decline?

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Abstract

Most children are born to cohabiting or married parents and being in a relationship is largely seen as a pre-requisite to childbearing. As such, the overall fertility rate of a country is influenced both by the proportion of the population that is partnered, and the fertility behaviour of those who are partnered. In many countries, including Australia, partnership rates have declined, and an increasing proportion of the population is single at any point in time. This paper examines how Australian fertility rates, from 1991 to 2019, have been affected by changing relationship patterns, and particularly the increasing rate of singlehood. We find that the decline in the proportion who are partnered has had a negative contribution to fertility levels, particularly at the younger ages.

Keywords Fertility · Relationships · Marriage · Cohabitation · Singlehood

Introduction

Most human births take place within a couple relationship. This is a fact that has held true throughout modern history and across societies. Recent estimates from English-speaking and European countries highlight that on a national scale, most children are born to cohabiting or married parents. Examples include: the United Kingdom in 2022, where 84% of births were registered to parents who were married, in a civil partnership or lived at the same address (Office of National Statistics, 2024), Spain in 2014, where 88% of births were to cohabiting or married parents (Cortina et

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al., 2017), with similar figures of 84% in the United States between 2014 and 2018 (Guzzo, 2021), and 89% in Iceland in 2024 (Statistics Iceland, 2025).

The fundamental link between relationships and fertility, was clearly identified by Bongaarts (1978) who referred to the proportion of women in a consensual union in a population as one of the proximate determinants of fertility. Unlike indirect effects such as education or income, a proximate determinant is one which has a direct relationship with fertility. Differences in fertility between countries, or within countries over time, can be explained by variations in these proximate determinants. Specifically, the proportion of women in a consensual union was identified as determining what proportion of the population was exposed to the risk of childbearing.

At the micro-level we can think of the process of childbearing in a simplified way as occurring in two stages. The first stage is establishing a relationship, and the second stage is having a child within that relationship. At the macro-level, fertility is determined by the proportion of the population that is partnered, as well as the fertility rate among those who are partnered. Hence, fertility may decline if individuals in relationships have fewer children and/or there are fewer people in relationships. All other things being equal, we would expect that a change in the proportion of the population who are partnered to effect the overall level of fertility.

In many countries there has been an increase in the proportion of the population of childbearing age that is single at any one point in time (Bergström & Brée, 2023). The trend in increasing singlehood has been most prominent in the East-Asian region (Esteve et al., 2020; Jones, 2018) but is also evident in Europe (Van den Berg & Verbakel, 2022), the United States (Fry & Parker, 2021) and in Australia. In Australia, in the 30 years between 1991 and 2021, the percentage of women aged 25–39 who were not living with a partner, either in a cohabitation or marriage, grew from 26 to 34% (Australian Bureau of Statistics [ABS], 1991, 2021). An increase in singlehood could be due to a combination of factors including an increase in the proportion of the population that is permanently single, increasing age at forming first unions, and increasing relationship dissolution (Bergström & Moulin, 2022; Billingsley & Oláh, 2022).

Despite the important role of the partnership composition of the population on fertility, there has been little research focused on establishing what contribution changing relationship trends, and in particular increasing rates of singlehood, may have on overall fertility levels in high-income countries. A major reason for the lack of research is likely due to lack of data. For many countries, the relationship status of mothers giving birth is not widely available in vital statistics collections, with most statistical agencies still only reporting births as occurring either within or outside of marriage (Lapante & Fostik, 2015). In countries where ex-nuptial fertility is negligible this dichotomous categorisation of births as being within or outside of marriage is acceptable. However, in countries across Europe and Latin America where births in cohabiting unions have become more common and socially acceptable (Lapante et al., 2016), and where an increasingly large share of births are born to cohabiting parents, the classification of births according to whether parents are married or not is problematic.

Among OECD countries, an average of 23% of births were to mothers who were not married in 1995. By 2020 this had almost doubled to 42% of babies born out-

side of marriage (OECD, 2023). In several European and Latin American countries including Chile, Costa Rica, Mexico, Iceland, France, Bulgaria, Slovenia, Estonia, Sweden, Denmark, Norway, Portugal, and the Netherlands births outside of marriage now outnumber births born within marriage (Eurostat, 2023; OECD, 2023). Without knowing what proportion of these ex-nuptial births are to parents in a union versus those who are single it is impossible to determine how fertility has changed at a macro or national level because of changing relationship patterns.

Recently, there have been renewed calls to consider partnership formation patterns as a key explanation for differences in fertility over time, or between countries (Andersson, 2023; Beaujouan, 2023; Billingsley & Oláh, 2022; Boissonneault & de Beer, 2022; Esteve et al., 2020; Rahnu & Jalovaara, 2023; Tan et al., 2025). In this paper we take up this call and explore how Australian fertility rates from 1991 to 2019 have been affected by changing relationship patterns, and particularly the increasing rate of singlehood.

Birth registration data from the Australian Bureau of Statistics (ABS), and a customised dataset of perinatal statistics provided by the Australian Institute of Health and Welfare (AIHW), are used to investigate how childbearing has varied over time due to changing relationship patterns in the population.

Background

A variety of approaches and types of data have been used to look at the role that relationship patterns play in determining fertility at the micro and macro-level. The fundamental link between relationships and childbearing has been well established at the individual level (Kuang et al., 2025). At the micro-level relationship status is often included as an independent variable in fertility studies but researchers have also more explicitly focused on the relationship status, both when looking at the start of the childbearing, timing of last birth, childlessness, and completed fertility. At the macro-level there is much less research due to a lack of data.

Individual level data has been used to look at the start of the childbearing process, and the link between relationships and the transitions to first birth. Examining the timing of first births, using Australian survey data, Lazzari (2022) finds a strong association between being married and a faster transition to first birth for both men and women. Also using survey data, from Sweden and Spain, Nishikido et al. (2022) investigate how relationship formation differences may explain differences in the transition to first birth between the two countries. In Sweden women were more likely to form stable relationships earlier compared to their Spanish counterparts, and more likely to transition to motherhood at a faster rate. The authors conclude that before age 30, 74% of the difference in first-birth transitions between the two countries could be explained by differences in the relationship composition of the female population. Finnish register data was used to investigate the role of changing relationship patterns on first birth rates between 2010 and 2018 (Hellstrand et al., 2022) with the authors concluding that lower fertility in unions explained around three-quarters of the total decline in first births during that period.

The link between relationships and fertility has also been established at the individual level by researchers looking at the other end of the reproductive life, including indicators such as completed fertility and childlessness. The number of years lived without a partner—whether having never had a partner, or due to a series of short partnerships—has consistently been found to be strongly associated with ending the reproductive life childless (Netherlands (Keizer et al., 2008), Germany (Raab & Struffolino, 2020), Czech Republic (Chaloupková & Hašková, 2020), Italy (Tocchioni, 2018), and Finland (Jalovaara & Fasang, 2017; Saarela & Skirbekk, 2020). Micro-level data highlight that lack of stable partnerships are a primary reason why people may not fully realise their fertility intentions and have fewer children than they would ideally like to have (Heard, 2007; Skirbekk, 2022). However, repartnering can also prompt increased childbearing (Andersson et al., 2022; Beaujouan, 2010; Ivanova et al., 2014).

In comparison to the abundant research establishing the role of partnerships and fertility at the micro-level, there is very little research estimating the effect of relationship status on overall fertility at the macro-level, either over time or across countries. This is primarily due to a lack of data availability and specifically due to an absence of birth data that categorises births by mother's relationship status including whether she is partnered or not, and not just whether she is married or not. In countries where ex-nuptial fertility is negligible researchers have successfully been able to demonstrate how fertility has changed due to changing marriage patterns as well as changing levels of marital fertility in nations. Raymo et al. (2015), for example, emphasise how shifting marriage patterns have impacted the total fertility rate (TFR) in Japan and South Korea, yet conditional on marriage, completed fertility has stayed consistently near replacement level in both countries. Similarly in China, Jiang et al. (2019) analyse how the change in fertility between 1989 and 2010 was due to both changing marital fertility and a change in the proportion of married women. Tan et al. (2025) also highlight the changing contribution over time of marital fertility, and the decline in the proportion of the population that is married, on total fertility rates in Taiwan, South Korea, Japan and Singapore.

Some work on the contribution of marital and cohabiting fertility to overall fertility has been done by Laplante, Fostik and colleagues. Using the own-child method of indirect estimation on census data, Laplante and Fostik (2015) compare fertility by relationship status in Quebec and Ontario from 1986 to 2006. They find that over time the fertility within cohabitation increased dramatically, especially in Quebec. In Latin-American countries the contribution of cohabitation to overall TFR has also changed over time and while in some countries marital fertility is the largest contributor of fertility to TFR, in others the contribution of cohabiting fertility to overall fertility is higher than that of marital fertility (Laplante et al., 2016). Studies examining overall fertility have primarily focused on assessing the contribution of marital or cohabiting fertility to the total fertility rate. Less attention has been given to how shifts in the population's relationship status composition have affected fertility.

Australian relationship and fertility trends

In the last three decades there have been two significant related trends that have characterised the changing relationship status of the population, including of women in the childbearing ages. The first has been a decline in the proportion of people who are married, and an accompanying increase in the proportion that are cohabiting with a partner in a non-marital relationship. Between 1991 and 2021, the percentage of women in the childbearing ages of 15–49, who were married fell from around half (54%) to 39%, while the percentage of women who were living with a partner but not married, increased from 6 to 16% (ABS 1991; 2021). The second related trend has been an increase in the proportion of people who are not living with a partner. In this paper we define them as ‘single’ although they may have a partner that they do not live with, including casual dating partners or more long-term ‘living-apart-together’ relationships (Reimondos et al., 2011). Among women aged 15–49, the percentage who are single has increased from 40% in 1991 to 45% in 2021.

In Fig. 1, the trends in the relationship status of women are detailed for different age groups. Cohabitation has become an increasingly common living arrangement particularly for women aged in their late 20s and early 30s. The 25–29 age group provides a good reference point for observing the large changes in partnering behaviour. In 1991 the majority (57%) of women in their late 20s were married, followed by single, and only 9% were recorded as cohabiting. By 2021, close to half of women in this age group were single (48%) and of those who were partnered it was slightly more common to be cohabiting compared to married. After age 30 differences across time in the relationship status of women by age have been more gradual, particularly when tracking the percentage who are single versus partnered. Among women in their thirties, the proportion who were single increased during the 1990s. However, since then, the percentage who are neither cohabiting nor married has remained relatively stable, at around 29–30% for those aged 30–34 and 25–26% for those aged 35–39.

There is little information known about the reason for the increase in singlehood in Australia. In countries such as France (Bergström & Moulin, 2022) the United States (Bloome & Ang, 2020), and England and Wales (Pelikh et al., 2022), age at first union formation has increased so it is very likely to be a factor in Australia. We also know from cohort studies in England and Wales (Pelikh et al., 2022), the United States (Dush et al., 2018; Eickmeyer, 2019) and Finland (Jalovaara & Andersson, 2023) that there has been an increasing trend among more recent cohorts for union dissolution. So it is likely that both an increase in the age at forming first unions, as well as an increase in relationship instability have been important factors in Australia, but there is no research available on trends in age at forming first unions in Australia, or on trends in relationship dissolution rates which consider both marriage and cohabitation, that would be able to confirm this.

Fertility trends

The experience of Australia in recent decades reflects similar fertility trends to many other English-speaking and European countries. Fertility has declined overall and there has been a shift of childbearing to later ages. In the last 50 years the total fertil-

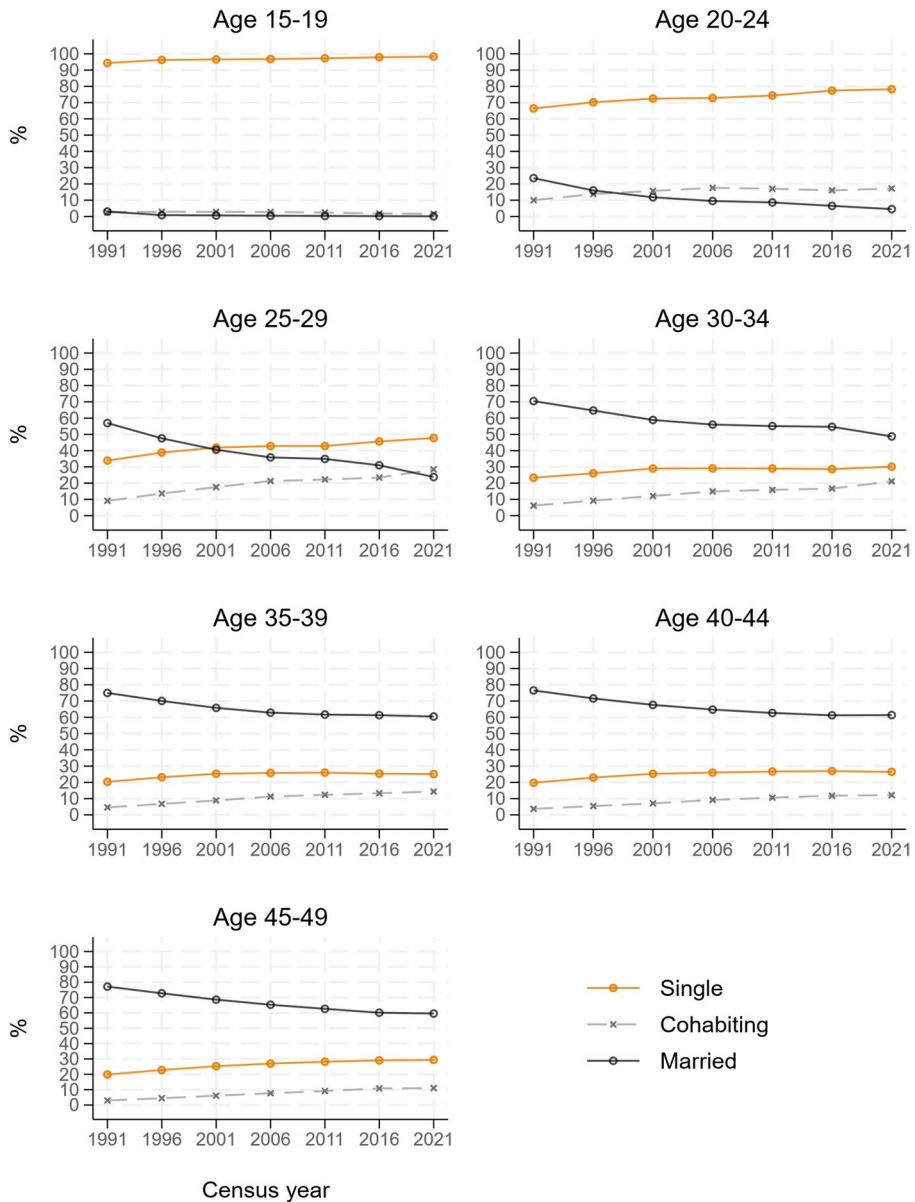


Fig. 1 Distribution of women by relationship status and age group and Census year. Source: Australian Bureau of Statistics (2001, 2011, 2021)

ity rate (TFR) has fallen from a peak of 2.95 in 1971 to 1.89 by 1980. Since then, it has remained below 2 children per woman, except for a peak of 2.02 in 2008. Since 2008 it has declined steadily reaching 1.67 in 2019 (ABS, 2023). The decline in fertility can also be seen when looking at the completed cohort fertility rate of women aged 40–44, which dropped from 2.46 in 1986 (Heard & Arunchalam, 2015) to 1.89

in 2021 (ABS, 2021). Women are also having children at later ages. In 1991, just 23% of first births were to mothers aged 30 and over but by 2022 this had increased to 54% (Qu et al., 2024).

Another notable trend has been a change in the relationship context in which children are born. Previously childbearing occurred almost exclusively within marriage, but today childbearing outside of marriage has become increasingly common. In 1991, around 1 in 10 births (11%) occurred outside of marriage, rising to 4 out of 10 births, or 40%, by 2023 (ABS, 2024). While it is generally agreed that this increase in ex-nuptial births is due to the growth of births to cohabiting parents rather than an increase in births to single mothers (Qu et al., 2024), to date it has not previously been possible to establish if that is the case. There has only been one direct estimate of what proportion of births are to married, cohabiting and single mothers in Australia. Using survey data from the Household Income and Labour Dynamics in Australia, De Vaus and Gray (2004) estimated that of children born in 2001, 11.6% were born to single mothers.

Using newly sourced data which identifies births by mother's relationship status at birth, we establish what proportion of births are born to mothers who are married, cohabiting or single at the time of birth. We then examine how fertility rates within each of these relationship states has varied over time. Finally, we use decomposition techniques to investigate how the changing trends in the proportion of women who are married, cohabiting or single as well as changing trends in fertility rates within marriage and cohabitation have shaped recent Australian TFR patterns.

Data

To decompose the effect of changing relationship patterns on overall fertility, two main pieces of information are needed:

1. Distribution of women by age and relationship status.
2. Distribution of births by mother's age and relationship status.

While we have data on births by mother's age and relationship up to, and including 2020, due to the disruption in both childbearing and relationship formation patterns brought on by the COVID-19 pandemic we restrict our analysis to the period between 1991 and 2019.

Data on women by age and relationship status

The distribution of women by age and relationship status is available from the 5-yearly census¹ in Australia using data from 1991, 1996, 2001, 2006, 2011, 2016

¹ There are some minor differences across the Census years in how social marital status is reported in the available data. In 1991, persons in 'non-classifiable households', 'non-private dwellings' or in migratory or offshore areas are reported as 'not married' whereas from 1996 onwards they are excluded for the relationship status variable. In 1991, same-sex couples are not included in the cohabitation or marriage proportions. Same sex-couples are included in the de-facto marriage or cohabiting proportions from 1996 to 2016 and from 2021 they are also included in the marriage statistics following the December 2017 amendments

and 2021, as shown in Fig. 1. Given that social change, such as changing relationship trends occur slowly over time, the trends have been relatively smooth across the Census years. As such we use a simple linear interpolation for the inter-censal years to derive a complete picture of the proportion of women by relationship status and age group, for each year between 1991 to 2019. These proportions are then applied to annual numbers of the mid-year Estimated Resident Population (ERP) of women by age which are published by the Australian Bureau of Statistics (ABS 2025), to derive the annual mid-year population of women by five-year age group and relationship status.

Data on births by mother's age and relationship status

The distribution of births by mother's age and relationship status come from two sources: registration data and perinatal statistics data. The registration data, available from the Australian Bureau of Statistic (ABS) categorises births by the mother's age, in 5-year age groups from 15 to 19 to 45–49, as well as if they occurred within marriage or outside of marriage. Data from perinatal statistics, provided by the Australian Institute of Health and Welfare (AIHW) as a customised dataset, identifies births by the age of the mother as well as whether she was partnered (married or cohabiting) or single at the time of the birth. The perinatal data classifies age in 5-year age groups, however the oldest age group is 40 and over. For consistency we split the births to women age 40 and over into births at age 40–44 and age 45–49 by using the same ratio of births in the early and late 40s as observed in the registration data. We assume that the proportions of births to partnered and single mothers at age 40+ is the same at ages 40–44 and 45–49. For some states and years, data on the mother's relationship status at birth was missing in the AIHW dataset. In cases of missing data, this was imputed using multiple imputation using additional information on age-specific fertility rates and proportion of women in partnerships.

There are some discrepancies in the total number of births in the registration data and the data from the perinatal statistics database, as the registration data classifies births at the date of registration rather than the date of occurrence. For example, a child born at the end of a year may not be registered until the following year. To maintain consistency with the national fertility rates published by the Australian Bureau of Statistics, we use the total registered births as our base and split these into births to partnered and unpartnered mothers based on the proportions in the perinatal data. This gives us the total number of births, by mother's age, for two categories: partnered mothers and unpartnered mothers. As the last step, the married births are subtracted from the total partnered births to calculate three categories of the mother's relationship status at the time of the birth: married, cohabiting, or single.

to the Marriage Act 1961 which enables marriage equality for all couples. Overall, these changes only have a minor impact on the trends over time.

Method

To examine trends overtime in fertility by relationship status we use three approaches. We begin by establishing what proportion of births are to married, cohabiting or unpartnered mothers and how this has changed over time. We then examine what contribution fertility in a particular relationship status has had on overall TFR and how this has changed over time. For this analysis TFR is expressed as the sum of a series of contributions from age-specific fertility in different relationships statuses.

$$TFR = 5 * \sum_{r=1}^3 \sum_{x=15-49} p_{rx} \frac{b_{rx}}{w_{rx}} = 5 * \sum_{r=1}^3 \sum_{x=15-49} p_{rx} ASFR_{rx}$$

Where r refers to relationship status, (in our case we have three states: married, cohabiting or single), p_{rx} is the proportion of women in relationship status r at age x , b_{rx} is the number of births to women in relationship status r at age x , and w_{rx} is the number of women aged x in relationship status r . For each relationship status, $p_{rx} ASFR_{rx}$, when summed over the reproductive ages, gives the contribution of fertility in that relationship state to the overall ASFR (and TFR).

While this formula allows us to look at overall trends and investigate what contribution fertility in a particular relationship status has had on overall TFR, it does not provide insight into *why* fertility in a particular type of relationship may have changed; whether the proportion of women in that relationship type has changed, or because the childbearing behaviour within that relationship state has changed. To gain further insight this we use the Das Gupta (1993) decomposition method. This decomposition technique allows us to separate changes in a rate, such as TFR, into two distinct components: rate effects and composition effects.

Decomposition methods have a long history in demographic fertility research and have recently been used to examine changes over time in various measures of period or cohort fertility according to specific population level compositional factors including among others; women's education level (Hwang, 2023; Schoumaker & Sánchez-Páez, 2024), paired education of men and women (Monteiro de Silva et al., 2022), nuptiality (Choi, 2022; Fanelli, 2023; Hwang, 2023; Jiang et al. 2019; Tan et al., 2025), ethnicity or citizenship status (Fanelli, 2023; Kroeger et al., 2023).

In this paper, the composition factor of interest is relationship status as we seek to quantify how a change in TFR over two time points has been influenced by a change in the composition of women who are married, cohabiting, or single as well as changes in the fertility rates within these relationship types.

Specifically the change in TFR between two periods of time, for example between 1991 and 2019 is expressed as a function of the change in the proportion of women in a given relationship status multiplied by the sum of average relationship specific ASFRs (composition effect) and the average proportion in a particular relationship status multiplied by the sum of the changes in relationship specific ASFRs (rate effect).

$$\Delta TFR_{1991-2019} = 5 * \sum_{r=1}^3 \sum_{x=15-49} \Delta p_{rx} \bar{ASFR}_{rx} + \bar{p}_{rx} \Delta ASFR_{rx}$$

$$\text{Composition effect} = 5 * \sum_{r=1}^3 \sum_{x=15-19}^{45-49} \Delta p_{rx} \overline{ASFR}_{rx}$$

$$\text{Rate effect} = 5 * \sum_{r=1}^3 \sum_{x=15-19}^{45-49} \bar{p}_{rx} \Delta ASFR_{rx}$$

We do this for women who are married (m), cohabiting (c) and single (s) but also group married and cohabiting women into a ‘partnered’ category. The decomposition is conducted in Stata using the *rdecompose* program by Li (2017).

Results

We start by examining the overall distribution of births by mother’s marital status at time of birth between 1991 and 2019. The overall percentage of births to partnered mothers (cohabiting and married) has remained relatively stable over time at around 85–90%. Among births to partnered mothers, there has been a gradual increase in the proportion who are cohabiting rather than married. Throughout the period, marriage was the most common setting for births but the proportion of births to married mothers has declined from 77% in 1991 to 64% in 2019, while there has been a corresponding increase in the proportion of births to cohabiting mothers, from 11 to 23%.

The relationship context of the birth is not surprisingly highly dependent on the mother’s age, as seen in Table 1 which compares the relationship status of births by the mother’s age in 1991 and 2019. In 1991, childbearing was more highly concentrated in the younger age groups. Just over one quarter of births were to women aged 24 or younger in 1991, falling to 13% by 2019. At these ages, births to single women were more common than at older ages, but as the percentage of births to young women has declined the percentage born to single mothers has increased. As age increases the percentage who are born to married mothers also increases, except for in the last age group where an increasing proportion of births are to cohabiting relationships. This is possibly due to repartnering with women in their 40s having ended a previous relationship and started childbearing in a new cohabitation.

Table 1 Distribution of births by mother’s age, 1991 & 2019

		Mother’s age							
	Relationship status (%)	15–19	20–24	25–29	30–34	35–39	40–44	45–49	Total
1991	Married	18	60	85	88	86	81	80	77
	Cohabiting	28	20	9	7	9	11	12	11
	Single	54	20	7	4	6	7	7	12
	Total	100	100	100	100	100	100	100	100
	% of all births at this age	6	20	36	28	9	1	0.04	
2019	Married	5	27	61	76	74	66	61	64
	Cohabiting	36	43	26	17	19	24	29	23
	Single	59	29	12	7	7	10	10	13
	Total	100	100	100	100	100	100	100	100
	% of all births at this age	2	11	26	36	20	4	0.4	

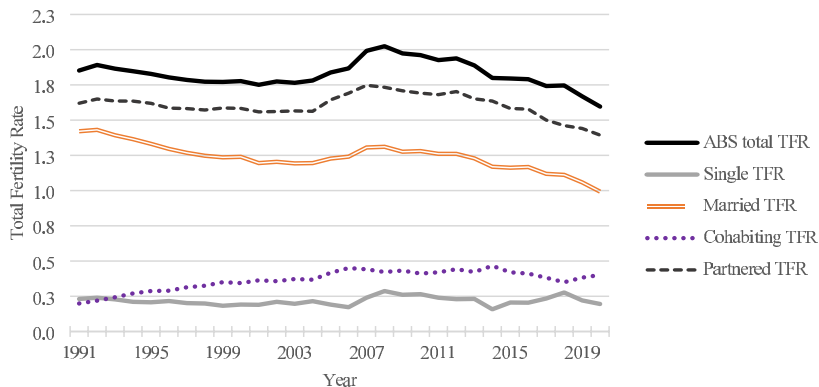


Fig. 2 Relationship specific TFR, 1991–2019

Next, we turn to the overall contribution of childbearing within different relationships to the TFR is shown in Fig. 2. Overall, the contribution of fertility from women who are single at the time of the birth, is small and has been relatively stable over time. This also means that as a percentage contribution, the share of partnered fertility (cohabiting and married) to overall TFR has also remained relatively stable. However, within the partnered group, as expected, the contribution of married fertility to TFR has declined, but the contribution of fertility within cohabiting unions has increased. The above analysis illustrates how childbearing within cohabitation has become increasingly common, while having a child within a marriage has declined.

While we have been able to confirm the increasing importance of cohabiting fertility, and the low and stable contribution of single fertility to understand how fertility has been shaped by the changing composition of the population by relationship status we turn to the decomposition analysis below. An overall decomposition examining fertility between the whole period from 1991 to 2019 is conducted, and the data is then also split into five time periods, from: 1991 to 1997; 1997 to 2002; 2002 to 2008; 2008 to 2014; and 2014 to 2019. These specific splits of years were chosen to capture different periods of increasing and declining fertility rates, as shown in Fig. 3. The overall decomposition results are shown in Table 2, while Fig. 3 displays a detailed breakdown by age group.

For the decomposition results, negative values indicate that the factor contributed to a decline in fertility over the relevant time period, whereas values above zero indicate a positive contribution. The composition and rate effects sum to equal the total change in TFR. For example, as shown in the last column of Table 2, between 1991 and 2019, TFR fell from 1.85 to 1.68 children per woman. This decline of -0.18 children is decomposed into the effect of the changing composition of women by relationship status (-0.418) and the fertility rates of women within each relationship status (+0.239). Since the effect of single women on changing fertility is minimal, in Fig. 3 we show only the effect for cohabiting and married women, although the total effect also includes single women.

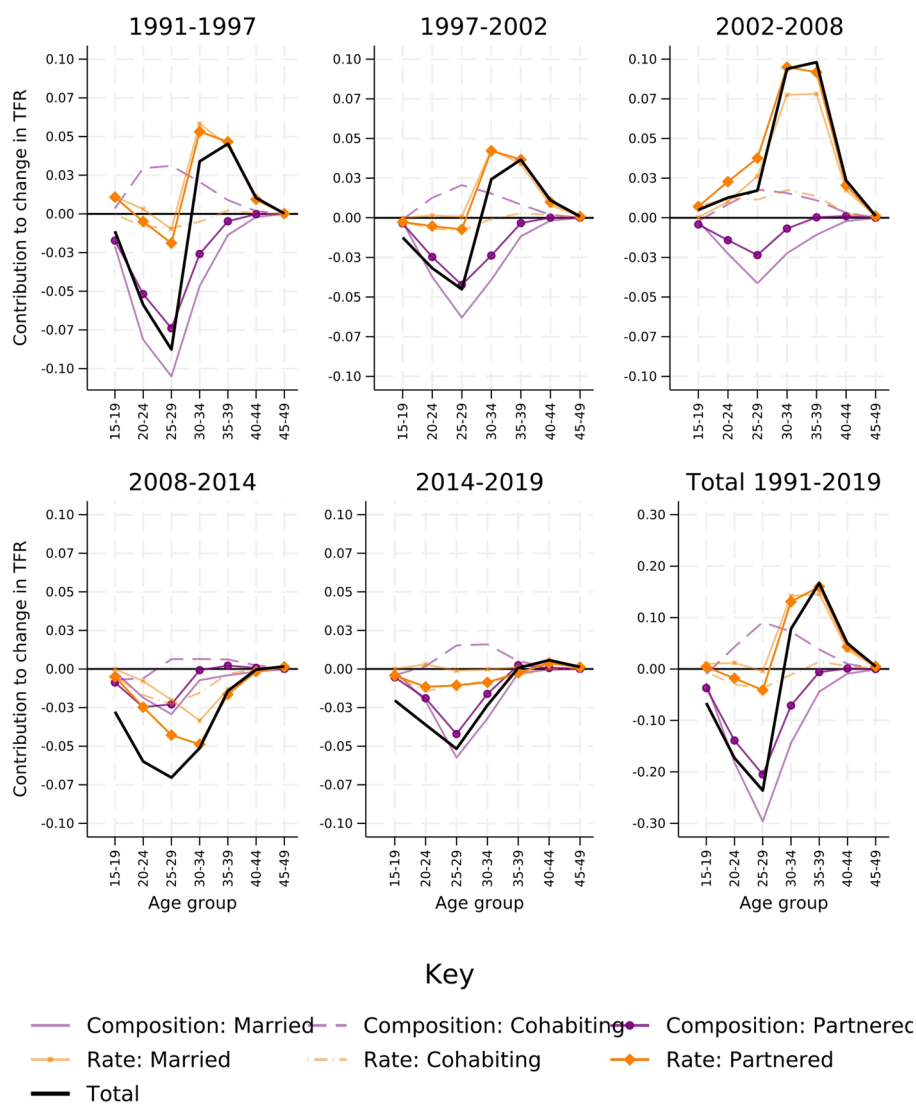


Fig. 3 Contribution of composition and rates, by relationship status, age for change in TFR 1991–2019

Starting with the total period between 1991 and 2019, we focus on the results in the last column of Table 2. During this period, the composition effect dominated. The decline in the share of women who were married had a large negative contribution of -0.703 to the change in TFR, and this was not completely offset by the positive contribution (0.245) of increased cohabitation. Among those women who are married, their fertility rate increased and had a positive contribution to TFR (0.346), while the fertility rate of cohabiting women exhibited a small decline (-0.0645). The overall positive contribution of higher fertility rates among partnered women, was

Table 2 Contribution of rates and composition to change in TFR (1991–2019) by time period

		1991– 1997	1997– 2002	2002– 2008	2008– 2014	2014– 2019	1991– 2019
TFR at start of period		1.854	1.787	1.770	2.021	1.799	1.854
TFR at end of period		1.786	1.770	2.021	1.799	1.675	1.675
Change in TFR		-0.068	-0.016	0.252	-0.222	-0.124	-0.179
Effect							
Composition	Married	-0.270	-0.155	-0.101	-0.063	-0.115	-0.703
	Cohabiting	0.096	0.058	0.054	0.009	0.035	0.245
	Partnered (Married & Cohabiting)	-0.174	-0.097	-0.047	-0.054	-0.080	-0.458
	Single	0.018	0.009	0.003	0.004	0.005	0.040
	Total	-0.156	-0.088	-0.044	-0.050	-0.075	-0.4181
Rate	Married	0.116	0.088	0.211	-0.075	0.008	0.346
	Cohabiting	-0.020	-0.013	0.065	-0.063	-0.040	-0.0645
	Partnered (Married & Cohabiting)	0.096	0.075	0.276	-0.138	-0.032	0.2815
	Single	-0.008	-0.003	0.020	-0.035	-0.017	-0.0426
	Total	0.088	0.072	0.297	-0.172	-0.049	0.2389
Total Composi- tion & Rate		-0.068	-0.016	0.252	-0.222	-0.124	-0.179

not enough to offset the negative composition effect of fewer women being partnered, and the overall change was therefore negative.

These broad level results can also be further broken down by age group, as seen in the last panel of Fig. 3. Here we see that the largest shifts, and the largest negative contribution to falling fertility over this period came from women in their twenties, while for women in their thirties the contribution was positive. For younger women, the composition effect dominated while at the older ages, particularly at ages 30–34 and 35–39 the positive rate effects were more significant. However, overall, the positive contribution or the rate effect in the 30+ ages was not enough to offset the negative contribution of the changes in composition at the younger ages.

The results above cover the entire period from 1991 to 2019, but breaking this timeframe down allows for a closer examination of fertility dynamics during phases of both increase and decline. During the first period, from 1991 to 1997, the Total Fertility Rate (TFR) decreased slightly from 1.85 to 1.79, a decline of -0.068 children. This reduction was largely driven by a decline in the proportion of women who were married. Although the share of women cohabiting increased, it was insufficient to counterbalance the overall decrease in the percentage of partnered women, resulting in a negative composition effect.

While fertility rates among married women rose, their contribution to changes in overall fertility levels was relatively modest. As illustrated in Fig. 3, the negative impact of the declining proportion of married women was evident across all age groups, with the most pronounced effect among women in their twenties. In contrast, the positive contribution of marital fertility was most noticeable among women in their thirties.

The period from 1997 to 2002 was marked by relative stability in the TFR, as previously shown in Fig. 3. During this time, the TFR declined only marginally from

1.79 to 1.77. The patterns of change in the composition of the female population by relationship status, as well as fertility rates within unions, were similar to those observed in the earlier period but less pronounced. Between 2002 and 2008, Australia like other developed countries experienced a period of increasing fertility. The TFR increased by 0.252 children from 1.77 to 2.02. During this period the contribution of the change in composition was relatively small (-0.044) compared to the overall positive increase in fertility within cohabitations as well as marriage (0.276). This period was unique in that there was a positive impact of cohabiting and marital fertility even among women in their twenties.

The next six years saw a decline in fertility, from the peak of 2.02 in 2008 to 1.8 in 2014. This decline was due to small but negative contributions from both a decline in the proportion of women who were partnered, as well as lower fertility rates within each relationship status. For the final period, from 2014 to 2019 the contribution of the changing composition of women, as well as the contribution of fertility rates within each relationship status was again negative, with the decline in the percentage of women who were married having the largest effect.

Discussion

The link between union formation and fertility has weakened, with it being increasingly common and socially acceptable for partnerships to not lead to childbearing (Kuang et al., 2025). However, at least in Australia while many relationships do not produce children, the link between childbearing and relationships is still very strong in the sense that most births occur within relationships. In Australia, the percentage of the population that is single at any point in time, has increased in recent decades. Our aim in this paper was to examine what effect falling partnership rates may have had on the overall fertility trends.

The first step was to establish fertility levels of partnered versus single women. This had previously not been possible to do due to lack of suitable data. Using perinatal statistics from 1991 to 2019 which categorised births according to whether the mother was partnered or not, we were able to establish that the vast majority of births in Australia (around 87% in 2019) are to partnered mothers. This figure is very similar to that observed in other countries including the United Kingdom, Iceland, and Spain. The proportion of births to single mothers has remained relatively stable over time, although there has been changes in the proportion of births to single mothers across different age groups. For example, as the childbearing in the early 20s has become less common the percentage of births to single mothers in this age group increased.

Our decomposition analysis examined how the changing composition of the female population by relationship status, as well as fertility within different relationship status effected overall fertility. The decline in the proportion of women who were married was evident across all age groups, and while there was a corresponding increase in the percentage of women who were cohabiting, it was not enough to offset the changing marital composition. The overall effect was therefore a negative contribution of changing composition by relationship status on fertility levels in all the time periods examined.

Although the decomposition analysis is descriptive and not able to establish causation, it was able to establish how fertility has changed within different relationship types. In terms of relationship specific fertility rates we found that fertility rates within the married population have had a positive contribution to fertility over time, although in the most recent time period the effect has been relatively small. Fertility within cohabiting unions has also had an overall negative contribution. While overall between 1991 and 2019, the rate effect has been positive, a further breakdown by time suggests that for the last two time periods the rate effect has been negative meaning that fertility rates among partnered women have been falling.

Although we establish that the decline in the percentage of partnered women has had a negative effect on overall fertility at the macro-level, our broad categorisation of single versus partnered women does not(?) provide enough detail to further unpack the link between singlehood and fertility. Among our single population we do not know what percentage have never partnered, or who have previously partnered but are now separated. As discussed, an increase in the proportion of the population who are single can be due to an increase in the proportion permanently single, an increase in age at forming first unions, or an increase in relationship dissolution. The effect of each of these factors would have a different impact on fertility. An increase in permanent singlehood is likely to have a negative effect on overall fertility, while an increase in age at union formation would also lead to a delay in the transition to first birth and a compression of the time available for childbearing (Beaujouan, 2023). Lastly, an increase in relationship dissolution may have opposing effects due to repartnering (Andersson et al., 2022; Ivanova et al., 2014), although the effect on overall national fertility may be small (Beaujouan, 2010).

In Australia there has been little research on the extent to which increasing singlehood at different ages is due to changes in age at union formation, or changes in relationship dissolution rates. Particularly for changes in age at union formation more investigation is also needed to establish the socio-economic causes of this and in relation to the housing market, education and changing labour markets.

The reasons behind falling partnership rates are complex and multi-faceted with several theoretical explanations which may differ across countries (Bellani et al., 2017). One reason, especially to explain the increase in age at first union formation is that increasing rates of education and university attendance have led to a consequent postponement of labour market entry and therefore ability to be economically self-sufficient and afford independent living (Buchmann & Kriesi, 2011). This may be exacerbated by increasing poor employment prospects and the casualisation of the labour market which can make it difficult to secure a stable full-time job. This has resulted in a general increase in age at leaving home, a pattern which can be seen across many Western countries including in Australia. For example, in 2001 around 36% of women aged 18–29 were living with their parents, increasing to 54% in 2017 (Wilkins & Vera-Toscano, 2019).

However, as cross-national research has highlighted, these trends only partly explain the trend. In many Southern European countries for example, young men especially stay living with their parents for many years after entering the labour market and becoming financially dependent due to a variety of reasons such as strong reliance on family, little government support, and a limited renting sector (Buchmann

& Kriesi, 2011; Corijn & Klijzing, 2001). In contrast, in countries with a strong and more affordable rental sector, with welfare regimes oriented towards the individual and weaker family ties (Buchmann & Kriesi, 2011) it is possible to leave home much earlier. Decoupling of leaving home and entering first union differ across countries (Corijn & Klijzing, 2001). For example in 2011 in Denmark, 50% of among 20–34 year olds are living with a partner, and of the other half of the population that is single, just 11% live with their parents. In contrast in Italy, in the same age range 71% of the population is single, and of those who are single 54% are living with their parents (OECD, 2023).

Another important explanation is the ideational and cultural shift towards individualism and self-actualisation, as outlined in the Second Demographic Transition Theory (Van de Kaa, 2002). Using the concept of Gidden's (1991) 'pure relationships' we can view modern union formation as more egalitarian and entered into and exited through choice. Relationships are initiated and kept going for as long as they provide emotional satisfaction and are sought out (p. 89). These relationships are a site for self-actualisation, and where couples who live together negotiate, define, monitor and justify the characteristics of their relationships (Hall, 2003). These shifts can lead to higher expectations for future partners and a consequent extended time in searching for a partner (Billari & Liefbroer, 2010; Skirbekk, 2022) but also increase the instability and risk of relationship dissolution.

Others emphasise the importance of changing gender dynamics which may affect willingness of women to enter relationships as well as the availability of suitable partners. Women's educational gains and increasing labour force participation have had an empowering effect and reduced the need to enter relationships due to economic reliance on the male wage. This has raised their expectations for their marriage and their partners (Skirbekk, 2022). In countries where women have higher education levels than men, and men's wages have stagnated there may also be partner market effects and a shortage of 'attractive' partners to choose from (Jones, 2018; Skirbekk, 2022).

When looking at fertility trends over time or between countries we believe it is useful and important to distinguish between factors that may impact fertility through their role on effecting union formation (for example housing affordability or longer time spent in education) and factors which may influence fertility within partnerships (such as declining childbearing desires, cost of children, difficulties balancing work and family in dual-income households, availability of childcare and parental leave). Esteve et al. (2020) note it is only it is through living independently and having a stable partnership that other social and economic changes affect fertility. This also applies to policies to support childbearing (Tan et al., 2025). While policies related to childcare provision and parental leave support can support the childbearing of those within couples, there are a variety of ways in which union formation can be supported. While some countries such as Singapore have attempted specific programs such as developing dating programmes to help singles find a partner (Chen et al., 2018) general policies to support young people in terms of housing, and secure labour market opportunities may indirectly impact fertility through their role in assisting with union formation.

Authors' contributions Anna Reimondos: Conceptualization, Methodology, Analysis, Writing. Bethan Allen: Investigation, Analysis, Writing. Ann Evans: Conceptualization, Investigation, Writing, Supervision. Edith Gray: Conceptualization, Investigation, Writing, Supervision.

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Data availability The data that support the findings of this study are from a combination of sources. Data on births by mothers age and marital status by state were provided by request from the Australian Institute of Health and Welfare and are not publicly available. For some individual states, such as South Australia, publicly available on births by mothers age and marital status are available for selected years from state perinatal statistics unit. For South Australia, these data can be found at the Wellbeing SA website (<https://www.wellbeingsa.sa.gov.au/evidence-data/explore-and-request-data/reports-and-publications>). Data on social marital status of the female population for each census year from 1991 to 2021, the Estimated Resident Population from 1991 to 2019, as well as overall number of births by mothers age from 1991 to 2019 are publicly available from the Australian Bureau of Statistics.

Declarations

Competing interests The authors have no competing interests to declare.

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References

- Andersson, L. (2023). A novel macro perspective on family dynamics: The contribution of partnership contexts of births to cohort fertility rates. *Population and Development Review*, 49(3), 617–649. <https://doi.org/10.1111/padr.12579>
- Andersson, L., Jalovaara, M., Uggla, C., & Saarela, J. (2022). Less is more? Repartnering and completed cohort fertility in Finland. *Demography*, 59(6), 2321–2339. <https://doi.org/10.1215/00703370-10351787>
- Australian Bureau of Statistics (1991). Australian census 1991. Retrieved September 19, 2023, from <https://www.abs.gov.au/census>
- Australian Bureau of Statistics (2021). *Australian census 2021*. Retrieved September 19, 2023, from <https://www.abs.gov.au/census>
- Australian Bureau of Statistics (2024). *Births, Australia 2023*. Retrieved March 15th, 2025, from <https://www.abs.gov.au/statistics/people/population/births-australia/latest-release>
- Australian Bureau of Statistics (2025). *Quarterly Population Estimates (ERP), by State/Territory, Sex and Age*. Retrieved March 20th, 2025, from <https://dataexplorer.abs.gov.au/>
- Beaujouan, É. (2010). Séparations, nouvelles unions: Quelles influences Sur La fécondité? *Population & Sociétés*, N° 464(2), 1–4. <https://doi.org/10.3917/popsoc.464.0001>
- Beaujouan, E. (2023). Delayed fertility as a driver of fertility decline? In R. Schoen (Ed.), *The demography of transforming families* (pp. 41–63). Springer International Publishing.
- Bellani, D., Esping-Andersen, G., & Nedoluzhko, L. (2017). Never partnered: A multilevel analysis of lifelong singlehood. *Demographic Research*, 37, 53–100. <https://doi.org/10.4054/demres.2017.37.4>

- Bergström, M., & Brée, S. (2023). Not a single meaning: Definition and evolution of singlehood in France and the United States. *Journal of Family Theory & Review*, 15(3), 465–484. <https://doi.org/10.1111/jftr.12519>
- Bergström, M., & Moulin, L. (2022). Couple formation is prolonged not postponed. New paths to union formation in contemporary France. *European Journal of Population*, 38(5), 975–1008. <https://doi.org/10.1007/s10680-022-09629-0>
- Billari, F. C., & Liefbroer, A. C. (2010). Towards a new pattern of transition to adulthood? *Advances in Life Course Research*, 15(2–3), 59–75. <https://doi.org/10.1016/j.alcr.2010.10.003>
- Billingsley, S., & Oláh, L. (2022). Patterns of co-residential relationships across cohorts in post-socialist countries: Less time for childbearing? *Social Inclusion*, 10(3), 87–99. <https://doi.org/10.17645/si.v10i3.5201>
- Bloome, D., & Ang, S. (2020). Marriage and union formation in the United States: Recent trends across racial groups and economic backgrounds. *Demography*, 57(5), 1753–1786. <https://doi.org/10.1007/s13524-020-00910-7>
- Boissonneault, M., & de Beer, J. (2022). Microsimulation of household and marital transitions leading to childlessness among Dutch women born between 1971 and 2000. *Demography*, 59(1), 137–160. <https://doi.org/10.1215/00703370-9624050>
- Bongaarts, J. (1978). A framework for analyzing the proximate determinants of fertility. *Population and Development Review*, 4(1), 105–132. <https://doi.org/10.2307/1972149>
- Buchmann, M. C., & Kriesi, I. (2011). Transition to adulthood in Europe. *Annual Review of Sociology*, 37(1), 481–503. <https://doi.org/10.1146/annurev-soc-081309-150212>
- Chaloupková, J. K., & Hašková, H. (2020). The diversity of pathways to childlessness in the Czech Republic: The union histories of childless men and women. *Advances in Life Course Research*, 46, 100363. <https://doi.org/10.1016/j.alcr.2020.100363>
- Chen, M., Yip, P. S. F., & Yap, M. T. (2018). Identifying the most influential groups in determining Singapore's fertility. *Journal of Social Policy*, 47(1), 139–160. <https://doi.org/10.1017/s0047279417000241>
- Choi, Y. (2022). A decomposition of declining crude birth rate in South Korea, 1990–2015. *Journal of Population Research*, 39(3), 373–389. <https://doi.org/10.1007/s12546-022-09287-3>
- Corijn, M., & Klijzing, E. (2001). Transitions to adulthood in Europe: Conclusions and discussion. In M. Corijn, & E. Klijzing (Eds.), *Transitions to adulthood in Europe* (pp. 313–340). Springer.
- Cortina, C., Castro-Martin, T., & Laplante, B. (2017). The changing demography of unmarried childbearing in Spain: Cohabiting vs. unpartnered mothers. Paper presented at the 2017 International Population Conference, Cape Town, South Africa.
- Das Gupta, P. (1993). *Standardization and decomposition of rates: A user's manual*. US Department of Commerce, Economics and Statistics Administration, Bureau of the Census.
- De Vaus, D. A., & Gray, M. (2004). The changing living arrangements of children, 1946–2001. *Journal of Family Studies*, 10(1), 9–19. <https://doi.org/10.5172/jfs.327.10.1.9>
- Dush, C. M. K., Jang, B., & Snyder, A. R. (2018). A cohort comparison of predictors of young adult union formation and dissolution in the US. *Advances in Life Course Research*, 38, 37–49. <https://doi.org/10.1016/j.alcr.2018.09.001>
- Eickmeyer, K. J. (2019). Cohort trends in union dissolution during young adulthood. *Journal of Marriage and Family*, 81(3), 760–770. <https://doi.org/10.1111/jomf.12552>
- Esteve, A., Boertien, D., Mogi, R., & Lozano, M. (2020). Moving out the parental home and partnership formation as social determinants of low fertility. *Vienna Yearbook of Population Research*, 18, 33–38. <https://doi.org/10.1553/populationyearbook2020.deb02>
- Eurostat (2023). *Marriage and divorce statistics*. Retrieved November 3, 2023, from https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Marriage_and_divorce_statistics#:~:text=The%20proportion%20of%20live%20births,children%20were%20born%20inside%20marriage
- Fanelli, E. (2023). Italian nonmarital fertility ratio: Components of an unexpected rise. *Population Research and Policy Review*, 42(5), 79. <https://doi.org/10.1007/s11113-023-09825-8>
- Fry, R., & Parker, K. (2021). *Rising share of U.S. Adults are living without a spouse or partner*. Pew Research Center.
- Guzzo, K. (2021). Trends in births to single and cohabiting mothers under 40, 1980–2018. Family profile no. 17. Retrieved February 15, 2023, from <https://www.bgsu.edu/ncfmr/resources/data/family-profiles/guzzo-trends-births-single-cohabiting-mothers-1980-2018-fp-21-17.html>
- Hall, D. R. (2003). The pure relationship and below replacement fertility. *Canadian Studies in Population*, 30(1), 51–69. <https://doi.org/10.25336/p6989z>

- Heard, G. (2007). Boom or gloom? Cohort fertility data from the 2006 census. *People and Place*, 15(3), 1–11.
- Heard, G., & Arunachalam, D. (2015). Fertility Differentials, pp. 159–196 in Heard, G. & Arunachalam, D (Eds.), *Family Formation in 21st Century Australia*. Springer Dodrecht. <https://doi.org/10.1007/978-94-017-9279-0>
- Hellstrand, J., Nisen, J., & Myrskylä, M. (2022). Less partnering, less children, or both? Analysis of the drivers of first birth decline in Finland since 2010. *European Journal of Population*, 38(2), 191–221. <https://doi.org/10.1007/s10680-022-09605-8>
- Hwang, J. (2023). Later, fewer, none? Recent trends in cohort fertility in South Korea. *Demography*, 60(2), 563–582. <https://doi.org/10.1215/00703370-10585316>
- Ivanova, K., Kalmijn, M., & Uunk, W. (2014). Fertility after repartnering in the netherlands: Parenthood or commitment? *Advances in Life Course Research*, 21, 101–112. <https://doi.org/10.1016/j.alcr.2013.08.003>
- Jalovaara, M., & Andersson, L. (2023). A register-based account of period trends in union prevalence, entries, and exits by educational level for men and women in Finland. *Demographic Research*, 48, 373–386. <https://doi.org/10.4054/demres.2023.48.14>
- Jalovaara, M., & Fasang, A. E. (2017). From never partnered to serial cohabitators: Union trajectories to childlessness. *Demographic Research*, 36, 1703–1720. <https://doi.org/10.4054/demres.2017.36.55>
- Jiang, Q., Yang, S., Li, S., & Feldman, M. W. (2019). The decline in china's fertility level: A decomposition analysis. *Journal of Biosocial Science*, 51(6), 785–798. <https://doi.org/10.1017/s0021932019000038>
- Jones, G. (2018). What is driving marriage and cohabitation in low fertility countries? In D. L. Poston, S. Lee, & H. G. Kim (Eds.), *Low fertility regimes and demographic and societal change* (pp. 149–166). Springer & Korea Institute for Health and Social Affairs.
- Keizer, R., Dykstra, P. A., & Jansen, M. D. (2008). Pathways into childlessness: Evidence of gendered life course dynamics. *Journal of Biosocial Science*, 40(6), 863–878. <https://doi.org/10.1017/s0021932007002660>
- Kroeger, R. A., Williams, C. E., Wildsmith, E., & Frank, R. (2023). Heterogeneity in Hispanic fertility: Confronting the challenges of Estimation and disaggregation. *The demography of transforming families* (pp. 135–179). Springer International Publishing.
- Kuang, B., Berrington, A., Vasireddy, S., & Kulu, H. (2025). The changing inter-relationship between partnership dynamics and fertility trends in Europe and the United States. *Demographic Research*, 52, 179–228. <https://doi.org/10.4054/DemRes.2025.52.7>
- Laplante, B., Castro-Martin, T., Cortina, C., & Fostik, A. L. (2016). The contributions of childbearing within marriage and within consensual union to fertility in Latin america, 1980–2010. *Demographic Research*, 34, 827–844. <https://doi.org/10.4054/demres.2016.34.29>
- Laplante, B., & Fostik, A. L. (2015). Two period measures for comparing the fertility of marriage and cohabitation. *Demographic Research*, 32, 421–442. <https://doi.org/10.4054/demres.2015.32.14>
- Lazzari, E. (2022). Pathways into childbearing delay of men and women in Australia. *Longitudinal and Life Course Studies*, 13(2), 307–334. <https://doi.org/10.1332/175795921x16197735939121>
- Li, J. (2017). Rate decomposition for aggregate data using Das gupta's method. *The Stata Journal*, 17(2), 490–502. <https://doi.org/10.1177/1536867X1701700213>
- Monteiro da Silva, J. H. C., de Lima, E. E. C., & de Oliveira, M. C. F. A. (2022). Educational pairings and fertility decline in Brazil. *Demographic Research*, 46, 147–178.
- Nishikido, M., Cui, Q., & Esteve, A. (2022). Partnership dynamics and the fertility gap between Sweden and Spain. *Genus*, 78(1), 1–20. <https://doi.org/10.1186/s41118-022-00170-w>
- Office of National Statistics (2024). Births by parents' characteristics– 2022 [Table 10]. Retrieved 1st April 2025, from <https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriage/s/livebirths/datasets/birthsbyparentscharacteristics>
- Organization for Economic Cooperation and Development (2023). *OECD family database. SF2.4 share of births outside marriage*. Retrieved November 1, 2023, from <https://www.oecd.org/els/family/database.htm>
- Pelikh, A., Mikolaj, J., & Kulu, H. (2022). Make up or break up? Partnership transitions among young adults in England and Wales. *Advances in Life Course Research*, 52, 100475. <https://doi.org/10.1016/j.alcr.2022.100475>
- Qu, L., Baxter, J., Andersson, C., & Jenkinson, R. (2024). *Births in Australia. Facts and Figs. 2024*. Retrieved April 7, 2025, from <https://aifs.gov.au/research/facts-and-figures/births-australia-2024>
- Raab, M., & Struffolino, E. (2020). The heterogeneity of partnership trajectories to childlessness in Germany. *European Journal of Population*, 36(1), 53–70. <https://doi.org/10.1007/s10680-019-09519-y>

- Rahnu, L., & Jalovaara, M. (2023). Partnership dynamics and entry into parenthood: Comparison of Finnish birth cohorts 1969–2000. *Advances in Life Course Research*, 56, 100548. <https://doi.org/10.1016/j.alcr.2023.100548>
- Raymo, J. M., Park, H., Xie, Y., & Yeung, W. J. J. (2015). Marriage and family in East asia: Continuity and change. *Annual Review of Sociology*, 41(1), 471–492. <https://doi.org/10.1146/annurev-soc-073014-112428>
- Reimondos, A., Evans, A., & Gray, E. (2011). Living-apart-together (LAT) relationships in Australia. *Family Matters*, 87, 43–55.
- Saarela, J., & Skirbekk, V. (2020). Childlessness and union histories: Evidence from Finnish population register data. *Journal of Biosocial Science*, 52(1), 78–96. <https://doi.org/10.1017/s0021932019000257>
- Schoumaker, B. D., & Sánchez-Páez, D. A. (2024). Disruptions in educational progress and fertility dynamics by educational level: Unraveling the link between education and fertility stalls in Sub-Saharan Africa. *Population and Development Review*, 50(1), 59–85.
- Skirbekk, V. (2022). *Decline and prosper! Changing global birth rates and the advantages of fewer children*. Palgrave Macmillan.
- Statistics Iceland (2025). *Live births by birth order and marital status of mother 1951–2022*. Retrieved April 7th, 2024, from https://px.hagstofa.is/pxen/pxweb/en/Ibuar/Ibuar_Faeddirdanir_faeddir_faedingar/MAN05104.px/table/tableViewLayout2/
- Tan, J., Cui, Q., & Uchikoshi, F. (2025). The increasing importance of changes in nuptiality: Policy mismatch and fertility decline in low-fertility Asian societies. *Chinese Sociological Review*, 1–30. <https://doi.org/10.1080/21620555.2025.2480296>
- Tocchioni, V. (2018). Exploring the childless universe: Profiles of women and men without children in Italy. *Demographic Research*, 38, 451–470. <https://doi.org/10.4054/demres.2018.38.19>
- Van de Kaa, D. J. (2002, January 29). The idea of a second demographic transition in industrialized countries. Paper presented at the Sixth Welfare Policy Seminar of the National Institute of Population and Social Security, Tokyo, Japan.
- Van den Berg, L., & Verbakel, E. (2022). Trends in singlehood in young adulthood in Europe. *Advances in Life Course Research*, 51, 100449. <https://doi.org/10.1016/j.alcr.2021.100449>
- Wilkins, R., & Vera-Toscano, E. (2019). *Over 50% of young Australian adults still live with their parents—and the numbers are climbing faster for women*. The Conversation. Retrieved November 2, 2023, from <https://theconversation.com/over-50-of-young-australian-adults-still-live-with-their-parents-and-the-numbers-are-climbing-faster-for-women-120587>

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