Successful Conception and Timely Parenthood in Germany

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Introduction

The ability to reproduce and become parents is considered central to individual identity and an important life goal for most people in nearly all societal contexts (Mikkelsen et al., 2009). However, reproductive behaviours in Western societies have undergone significant transformations over past few decades and remain in a state of ongoing change (Boivin et al., 2018; Gnoth et al., 2003). Research has revealed that nearly half of both men and women do not have their first child by their initial desired age, primarily due to the pursuit of other life projects and considering alternatives to parenthood. Women are having fewer children and the waiting time to commence attempts at conception has extended considerably delaying births to a later age than in previous years (Wesselink et al., 2017). This trend of delaying childbirth to later ages has been attributed to several factors, including changes in norms and family values, housing and economic conditions, increased opportunities for education and career development, effective contraception, unstable and delayed partnerships, gender equity, and absence of supportive family policies (Mills et al., 2011). However, the increase in the age at which people start forming a family poses a risk to its realization as it is well-documented that fecundity, the biological capacity to conceive, declines with age (Dunson et al., 2004). Several studies have consistently demonstrated that female fertility declines as early as the late twenties, with a more pronounced decrease occurring by the late thirties (Dunson et al., 2002). In contrast, research on male fertility has produced mixed and inconclusive results (Chen et al., 2008), with some studies indicating a decline in conception rates in the early thirties (Ford et al., 2000), some proposing a threshold age in the late thirties (Dunson et al., 2002), and others suggesting a significant decline after the age of 40 (Johnson et al., 2012). A study by Jensen et al., (2000) even reported an increase in fertility with age but raised concerns about potential biases affecting the result. Given the mixed results regarding age and fertility, there is a compelling need to investigate the intricate relationship between age and reproductive outcomes for both men and women, particularly in the context of contemporary trends of delayed childbearing.

Time to pregnancy (TTP), a widely used measure in epidemiological studies, assesses the extent of delays in achieving conception across the full spectrum of biological fertility for both men and women by quantifying the number of menstrual cycles required for a clinical pregnancy (Gnoth et al., 2003; Joffe, 1997). Prospective and retrospective studies have indicated that the maximum conception rate per cycle is around 30%, with a 60% success rate after six menstrual cycles and an overall cumulative pregnancy rate of approximately 82% following 12 menstrual cycles (Bonde et al., 1998; Gnoth et al., 2003; Zinaman et al., 1996). When considering the overall conception rates and the clinical definition of infertility, it becomes evident that almost half of couples might encounter subfertility or infertility among those 20% failing to conceive within six cycles and about 10% within 12 cycles (Gnoth et al., 2003).

In theory, factors that disrupt any of the biological processes essential for attaining pregnancy may reduce fecundability in both men and women (D. D. Baird et al., 1986). While descriptive studies do indicate age-related declines in fertility, it's important to note that these declines may be influenced, at least in part, by factors such as insufficient motivation in older couples which can manifest in altered reproductive behaviours, such as a decrease in sexual activity with advancing age (Bachrach & Horn, 1987; Bottiglioni & De Aloysio, 1982; Klerman, 2000). Several biological, lifestyle, environmental, and work-related factors have been suggested to affect the female reproductive system potentially

leading to disruptions in the menstrual cycle, an elevated risk of miscarriage, delayed conception, and reduced fertility (McDonald et al., 1986; Sallmén et al., 2003). However, quantitative analyses revealed that statistical models presented with explanatory variables related to these factors explained only a relatively small fraction of the variation in the TTP which implies that there is a likelihood that the variation in TTP is influenced by male factors and other yet unidentified female factors (Axmon et al., 2006).

It has been proved that "Readiness to conceive" is a complex decision, shaped by the significance attached to a range of social, economic, and personal factors (Rosina & Testa, 2009). Our study seeks to explore whether individuals who attempt to conceive face equal prospects of achieving pregnancy and childbirth or if the outcomes of these efforts are also shaped by a combination of biological, socio-demographic, personal, lifestyle, and reproductive factors. This research aims to delve into these intricacies through a comprehensive study conducted in Germany, which, due to its consistently low fertility rate, offers a suitable and representative context for investigating these multifaceted dynamics.

Data and methods

Analyses are based on data from the German Family Panel (pairfam), release 14.0 (Brüderl et al., 2022). Pairfam covers a wide range of topics related to partnership and family dynamics in Germany. Launched in 2008, the multidisciplinary study consists of a nationwide random sample of over 17,000 women and men from four birth cohorts (cohort 1: 1991-93, cohort 2: 1981-83: cohort 3: 1971-73, cohort 4: 2001-03).

We restrict our analysis to the three older cohorts and utilized the waves 1 to 14 retaining only the base sample of individuals who have been participants since the first round of survey. We started by merging all the waves from 1 to 14 consisting of 12,402 individuals with 80010 person-years. Because we are interested in the biological aspects of conception, we dropped respondents who were homosexual, or identified as non-binary. Additionally, we excluded observations in which individuals attempted to conceive but were unsuccessful and had reported use of sterilization in previous wave, as these factors could potentially influence the negative outcomes of attempts. To address missing data, we conducted imputations for variables linked to the number of biological children, pregnancy status, and attempts to conceive. This involved examining the interrelationships between these variables across preceding and succeeding waves. Our analysis specifically focuses on person-years in which respondents provided affirmative responses to questions regarding their attempts to conceive in the preceding 12 months.

The final analytic sample includes 4799 observations/ person-years contributed by 1026 men and 1306 women of reproductive age who attempted to conceive. Predictive variables used in the analysis were extracted from the wave preceding the one in which the individual affirmed their attempts to conceive within the last 12 months. The outcomes of these attempts were documented in the same wave in which the individual acknowledged their attempt to conceive. At that time, the respondent (or their partner) could be either pregnant or have had a child since the last wave. Observations from wave 1 were excluded due to the unavailability of prior independent variable data for this particular wave. In terms of parenthood outcomes, men contributed 2,114 person-years, achieving parenthood in 985 cases (46.6%), while women, contributing 2,685 person-years, experienced conception success in 1,179 cases (44%).

Our analysis encompasses an array of socio-demographic, reproductive, and behavioural factors as independent variables. In first explorations, the associations between these variables and the dependent variable were scrutinized through chi-square tests (categorical variable) and t-tests (numerical variable). Given the binary categorical nature of our outcome variable, namely the occurrence of pregnancy or childbirth, we employed a pooled binary logistic model for our multivariate analysis. This model accounts for clustered errors arising from multiple observations by the same individuals within our dataset.

Preliminary results

Table 1 presents the mean and distribution for the predictor variables for men and women who tried to conceive in the last 12 months by their status of attaining pregnancy.

Table 2 shows the statistical effect of predictor variables on the likelihood of pregnancy or childbirth within a year for men and women. Notably, age and parity emerge as highly significant factors for both genders. While increasing age is associated with a decline in the probability of conception, higher parity substantially elevates the odds of conception for both men and women, highlighting the importance of previous childbirth experiences. These findings align with the well-established understanding that women experience a more pronounced decrease in conception prospects in contrast to men. Previous contraceptive use significantly predicts higher odds of conception for both genders. While these trends hold for both men and women, several factors exhibit gender-specific significance. Education level plays a distinctive role, with highly educated women showing a greater likelihood of successful conception. For women, relationship satisfaction, frequency of sexual intercourse, and recent miscarriage are significant predictors, suggesting that women who experience high relationship satisfaction, engage in more frequent sexual intercourse, and have had a recent miscarriage are more likely to achieve pregnancy when trying to conceive. Additionally, body mass index (BMI) has varying effects on men and women, with underweight and obese men having higher and lower odds of conception, while overweight and obese women have reduced odds than their counterparts having normal weight. The relationship between subjective health and the probability of conception proves significant for men. Men reporting average health status are 64% more likely to attain parenthood than those with poor health, while those in good health exhibit 68% more likelihood of becoming parents compared to those in poor health. Perceived status of infertility among men and women reduces their likelihood to achieve successful conception by more than 35% to when having a perception of being fertile. Men with younger partners also have a higher likelihood of achieving parenthood compared to those with partners of the same age, with a 41% increased likelihood.

Figure1 is a graphical representation of the relationship between age and chances to achieve pregnancy among men and women which clearly reconfirms the previous findings that with increasing age, the chances to have successful conception diminishes. The odds ratio have been derived from the statistical model presented in table 2.

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Tables and Figures

Table 1: Respondents characteristics by pregnancy/childbirth status.

	Men (n = 2114)			Women (n = 2685)		
	Birth/pregnant in one year (n = 985)	No birth/pregnancy in one year (n = 1129)	p-value	Birth/pregnant in one year (n = 1179)	No birth/pregnancy in one year (n = 1506)	p-value
	(Mean/%)	(Mean/%)		(Mean/%)	(Mean/%)	
Average age (15-50) years	32.17	34.12	**<0.001**	29.80	32.02	**<0.001**

Age groups						
(15-24) years	4.5	3.2		9.4	7.4	
(25-29) years	31.5	20.0		44.2	29.4	
(30-34) years	24.6	19.4		22.3	22.1	
(35-39) years	31.7	41.1	**<0.001**	22.6	31.8	**<0.001**
(40-44) years	6.3	13.0		1.2	7.5	
(45-50) years	1.4	3.3		0.3	1.8	
Level of education						
low	16.3	13.1		16.5	14.6	
Medium	42.9	49.3		47.3	53.0	
High	40.4	37.6	**<0.05**	36.2	32.4	**<0.05**
Missing/Don't know	0.4	0.0		0.0	0.0	
Parity						
0	52.5	65.9		46.5	64.8	
1	30.8	26.5		35.8	25.1	
2	11.7	5.7	**<0.001**	12.2	8.1	**<0.001**
3 and more	5.0	1.9		5.5	2.0	
Age gap with partner						
Both of same age	9.7	11.6		8.7	8.1	
Partner is older	14.7	18.7		66.1	69.0	
Partner is younger	68.5	63.1		16.5	15.5	
Missing/No partner	7.1	6.7	0.15	8.6	7.4	0.82
Relationship satisfaction	8.21	8.12	0.29	8.23	8.07	**0.05**
Sexual satisfaction	6.81	6.38	**<0.001**	6.84	6.78	0.53
Frequency of sexual intercourse in previous year						
2-3 times per month or less	33.1	35.3		30.7	34.0	
Once per week	18.1	17.8		17.8	18.1	
2-3 times per week or more	26.2	25.1	0.48	25.7	25.4	**<0.05**
Missing/Don't know	22.6	21.8		25.8	22.4	
Previous contraceptive use						
Yes	52.2	35.5		53.8	29.4	
No	39.2	54.9	**<0.001**	39.6	63.8	**<0.001**
Missing/Don't know	8.5	9.6		6.6	6.8	
Health status						

Bad	6.2	10.4	**<0.01**	13.5	16.5	**<0.01**
Average	20.3	23.2		22.4	24.9	
Good	73.0	66.3		64.0	58.5	
Missing/Don't know	0.4	0.0		0.1	0.0	
Body mass Index (BMI)						
Underweight	0.9	0.1	**<0.001**	3.4	3.1	**<0.001**
Normal weight	44.2	38.0		60.4	52.9	
Overweight	41.1	41.1		23.3	25.6	
Obese	13.4	20.7		11.3	17.2	
Missing/Don't know	0.3	0.0		1.6	1.1	
Perceived fertility status (couple level)						
Fertile	85.8	78.5	**<0.001**	86.5	80.0	**<0.001**
Infertile	7.1	15.3		6.1	13.1	
Missing/Don't know	7.1	6.2		7.5	6.9	
Miscarriage since last 2 years						
Yes	3.4	5.7	0.20	4.9	4.8	**<0.05**
No	72.3	69.9		70.6	75.8	
Missing/Don't know	24.3	24.4		24.5	19.4	

Note – Survey weights are applied to the percentages.
Mean and percentages are calculated by person-years.

Table 2: Results of Binary logistic regression model for pregnancy/childbirth within a year among men and women of reproductive age who reported attempts to conceive.

	Men		Women	
	Odds Ratio	**S.E**	**Odds Ratio**	**S.E**
Age groups				
(15-24) years	Ref.		Ref.	
(25-29) years	1.07	0.32	0.96	0.24
(30-34) years	0.81	0.32	0.6*	0.27
(35-39) years	0.45**	0.33	0.34***	0.27
(40-44) years	0.27***	0.38	0.08***	0.39
(45-51) years	0.25***	0.52	0.05***	0.7
Level of education				
low	Ref.		Ref.	
Medium	0.84	0.18	1.21	0.22
High	1.09	0.19	1.74**	0.23

Parity				
0	Ref.		Ref.	
1	1.64***	0.12	2.54***	0.13
2	3.58***	0.18	3.78***	0.21
3+	4.46***	0.36	9.98***	0.33
Age gap with partner				
Same age	Ref.		Ref.	
Partner is older	0.78	0.23	0.98	0.18
Partner is younger	1.41*	0.19	1.26	0.22
Relationship satisfaction	0.98	0.03	1.06**	0.03
Sexual satisfaction	1.08***	0.03	0.95**	0.02
Frequency of sexual intercourse in previous year				
2-3 times per month or less	Ref.		Ref.	
Once per week	0.89	0.15	1.23	0.15
2-3 times per week or more	0.85	0.15	1.39**	0.16
Previous Contraceptive use				
No	Ref.		Ref.	
Yes	1.44***	0.13	1.97***	0.11
Health status				
Bad	Ref.		Ref.	
Average	1.64**	0.21	1.03	0.17
Good	1.68***	0.19	1.15	0.15
Body mass Index (BMI)				
Normal weight	Ref.		Ref.	
Underweight	7.34***	0.71	0.95	0.27
Overweight	0.92	0.12	0.81*	0.12
Obese	0.6***	0.15	0.68**	0.17
Perceived fertility status				
Fertile	Ref.		Ref.	
Infertile	0.69*	0.21	0.66*	0.21
Miscarriage since last 2 years				
No	Ref.		Ref.	
Yes	0.78	0.22	1.68**	0.23
Constant	0.43*	0.48	0.29***	0.39

Person-years	2114	2685
Persons	1026	1306

Figure 1: Probability of successful conception by age groups among men and women.