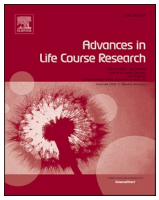
Advances in Life Course Research 55 (2023) 100518

Contents lists available at ScienceDirect

Advances in Life Course Research

journal homepage: www.elsevier.com/locate/alcr



Sleep hours and quality before and after baby: Inequalities by gender and partnership

Shih-Yi Chao [a,b,*], Brienna Perelli-Harris [b], Ann Berrington [b], Niels Blom [c]

[a] Academia Sinica, Taiwan
[b] University of Southampton, UK
[c] City, University of London, UK

ARTICLE INFO

Keywords:
Life course
Partnership status
Fertility
Sleep
Gender equality

ABSTRACT

While prior studies have examined sleep across the lifecourse, few studies have investigated sleep around the birth of a child, one of the most important events to cause sleep deprivation. This study investigates changes in sleep hours and quality, paying attention to differences by gender and partnership status. Using the UK Household Longitudinal Study, we follow approximately 1,000 participants as they transition into parenthood in a three-year window. We use OLS and logistic regression to analyze changes in sleep hours and sleep quality. Results suggest that women's sleep is reduced by an average of 0.7 hours (42 min) on becoming a mother. Whilst before parenthood women sleep more than men, after childbirth women and men sleep similar amounts. Cohabiting men experience a greater reduction in sleep by around 0.5 hours (30 min) than married men, to the level similar to women, suggesting that new cohabiting fathers may experience more sleep disturbances.

1. Introduction

People who say they sleep like a baby usually don't have one.

- Leo. J. Burke

Sleep is not only related to physical and psychological wellbeing (Gangwisch et al., 2005; Gottlieb et al., 2006; Patel, 2007), but is also a reflection of social roles (Patel, 2007). Entry into parenthood is a crucial period for redefining social roles and responsibilities. Being a new parent brings intense sleep disruptions, with demanding night-time caregiving responsibilities that can continue for years (Richter et al., 2019). This study uses a longitudinal panel dataset to investigate how early parenthood changes sleep duration and quality, emphasizing how gender and partnership status shape sleep.

Prior studies have indicated that parents get fewer hours of sleep and have worse sleep quality than non-parents (Burgard & Ailshire, 2013; Hagen et al., 2013; Ruppanner et al., 2021). However, sleep disturbances differ according to gender and partnership status. Becoming a parent shifts gender roles and expectations (Grinza et al., 2022), as well as widens gender inequalities (Baxter et al., 2015; Schober & Scott, 2012). The changes in gender disparities after parenthood could be revealed in patterns of sleep (Hislop & Arber, 2003).

Cohabiting individuals, compared with married people, tend to have worse health (Musick & Bumpass, 2012; Perelli-Harris & Styrc, 2018) and health behaviors (Rapp & Schneider, 2013; Umberson et al., 2006), which can have long-term implications for later life health (Chen et al., 2015) and longevity (Liu & Reczek, 2012). Sleep may be another health-related behavior which differs between cohabitors and the married. Furthermore, gender differences in sleep patterns might differ for married and cohabiting couples. Marriage is often a more traditional partnership than cohabitation, being more likely to conform to conventional gender roles, particularly after entrance into parenthood (Bianchi, 2000; Chao, 2022). Cohabiting men and women tend to have more equal gender role attitudes and may experience less of a sleep differential. Yet few studies have directly compared cohabiting and married people upon entrance to parenthood (for exceptions see Pepin et al., 2018, and Kissling, 2020 who compare cohabiting and married mothers).

Today in the UK, childbearing within cohabitation has increased substantially, as around one third of births are within cohabitation (Office for National Statistics, 2017). However, cohabiting partnerships are more fragile than marriages, with nearly one fifth dissolving before the first child's fifth birthday (Chao, Blom et al., 2020). Moreover, cohabitors in the UK are often socioeconomically disadvantaged and

* Correspondence to: Institute of Sociology, No. 128, Sec. 2, Academia Rd., Nankang, Taipei 11529, Taiwan.
E-mail address: sychao@gate.sinica.edu.tw (S.-Y. Chao).

https://doi.org/10.1016/j.alcr.2022.100518
Received 14 September 2021; Received in revised form 7 November 2022; Accepted 10 November 2022
Available online 13 November 2022

have worse health and mental well-being than married individuals (Perelli-Harris et al., 2018; Perelli-Harris et al., 2017), leading to a difference in gender performance and specialization (Chao, Berrington et al., 2020). As a result, the UK is an ideal context to examine how sleep behaviors change and adapt between cohabiting and married individuals.

This paper makes a number of contributions. Unlike prior studies, most of which are based on cross-sectional surveys, we directly measure changes in sleep during the transition to parenthood and their disparities by gender and partnership type. Using the UK Household Longitudinal Study, we examine how sleep hours and quality change with the transition to parenthood and provide a nuanced view on how parenthood is related to gender differences in sleep. If women sleep more than men before a birth, but a similar amount after birth, focusing exclusively on sleep among parents may lead to the false conclusion that there is no inequality in sleep, even though women experience a larger decline following parenthood. Second, we compare two indicators of sleep which have produced conflicting findings in the literature (Burgard & Ailshire, 2013; Maume & Ruppanner, 2017). By examining both sleep duration and quality, we can reconcile these conflicting findings as they reveal different dimensions of gender inequality. Finally, we examine the characteristics of married and cohabiting partnerships to try to better understand underlying differences in sleep by gender and partnership status. Therefore, our study on disparities in sleep reveals more about social structure and partnership context than simply confirming prior findings on losses in sleep after parenthood.

2. Background

Trends in sleep patterns reflect wider societal changes. Globalization, work flexibilization, and increased female labor participation have significant implications for gender roles and work-family life (Trask, 2013). Long working hours combined with intensive family demands lead to time deprivation and sleep deficit (Jacobs & Gerson, 2004; Schor, 1991). A squeeze on time, role overload, and work-family conflict will influence both sleep quantity and quality. These societal changes have been experienced differently depending on gender and partnership type. Mothers encounter a greater struggle juggling work and family demands than fathers (Stone, 2007; Hochschild and Machung 2012), which could lead to greater sleep disturbances for mothers. Cohabitors, compared to married couples, tend to be socioeconomically disadvantaged (Ishizuka, 2018; Perelli-Harris & Blom, 2021). They also have a higher proportion of female-breadwinner households (Chao, Berrington et al., 2020). Existing research has identified differences in gender division of labor and gender attitudes between cohabitors and married couples (Chao, 2022; Edin & Nelson, 2013; Jacobs & Gerson, 2004). These factors indicate that research needs to consider not only gender differences in sleep during the transition to parenthood, but how these gender differences vary between cohabiting and married couples.

2.1. Gender, parenthood, and sleep

Women, overall, report longer average sleep hours than men (Burgard & Ailshire, 2013; Krueger & Friedman, 2009). Studies from biology and psychology speculate that women need more sleep due to biomedical factors, such as physiological and hormonal characteristics, or chronic health conditions (Chen et al., 2005; Dzaja et al., 2005). These gender differentials persist (Chen et al., 2015; Hislop & Arber, 2003), becoming more or less pronounced at different life stages (Burgard & Ailshire, 2013). However, a growing body of research suggests that gender differences in sleep are also shaped by social factors which influence social roles and time use (Basner et al., 2007; Burgard & Ailshire, 2013; Pepin et al., 2018). Once couples enter into a co-residential relationship, their roles blend and shift to accommodate each other's employment and housework (Lin & Burgard, 2018). They are more inclined to conventional gender performance (Berk, 1985; Chao, 2022), with men in paid employment and women doing unpaid work (Bianchi, 2000). These different roles could influence the amount of sleep men and women get, as men's longer working hours have been strongly associated with less sleep (Burgard & Ailshire, 2009; Chatzitheochari & Arber, 2009; Krueger & Friedman, 2009). Recently, however, childless women's employment has reached parity with men's in the UK (Office for National Statistics, 2019), raising questions about whether men and women's work schedules equally impact sleep, especially before having a child.

Women's longer sleep hours, however, do not necessarily reflect better sleep quality, and may instead be compensating for poor sleep. Prior studies have found that women are more prone to sleep disruption and have worse "sleep maintenance" (Arber et al., 2009; Maume & Ruppanner, 2017; Meadows & Arber, 2012). These sleep disturbances may have an underlying biological basis, for example due to menstrual and hormonal factors (Chen et al., 2005; Dzaja et al., 2005), or worse health conditions and higher levels of depression and anxiety (Maume et al., 2009).

Parenthood potentially leads to greater gender differences in sleep hours and quality. Biologically, women need to recover from pregnancy and delivery, and wake at night for breastfeeding, potentially leading to fewer sleep hours and worse sleep quality compared to men (Burgard, 2011). Becoming a parent requires new caring responsibilities, often disproportionately borne by women, especially initially. Gender roles often become more traditional (Baxter et al., 2015; Chao, 2022; Schober & Scott, 2012), with fathers increasing or maintaining their paid working hours, and mothers reducing their commitment to paid work to take on unpaid work (Evertsson, 2013; Jacobs & Gerson, 2004; Young & Schieman, 2018), leading to unequal sharing in household responsibilities (Raley et al., 2012; Yavorsky et al., 2015). As mothers shoulder more housework and childcare (Baxter et al., 2008; Musick et al., 2016; Sayer, 2016), they may "protect" their partners' sleep so they can focus on work (Maume et al., 2010). Hence, sleep has been described as women's "fourth shift", when physical and emotional caring continue into the night after performing paid work, housework, and emotional care in the daytime (Venn et al., 2008). However, the question is to what extent motherhood leads to *additional* inequalities, especially relative to fatherhood, since the transition into parenthood potentially has a larger impact on women in terms of biological demands and gendered expectations for housework and care. Despite women on average sleeping more than men before parenthood, we expect that *women will have a greater loss in sleep hours (H1a) and sleep quality (H1b) than men over the transition to parenthood.*

2.2. Partnership status, parenthood, and sleep

Living in an intimate partnership, either marriage or cohabitation, conveys benefits which can carry over into sleep duration and quality (Kissling, 2020; Pepin et al., 2018). Couples may sleep better due to sexual and emotional intimacy, regular interactions and schedules, and monitoring each other's behaviors, for example reminding each other to go to bed (Umberson et al., 2010). However, not only living with a partner but being married may be associated with a better night's sleep. Marriage tends to be selective of qualities which may promote better sleep hygiene. For example, married couples are more likely to have higher education (Mikolai et al., 2018), steady employment and economic security, and better relationship quality (Perelli-Harris & Blom, 2021). Married individuals tend to be healthier than cohabitors (Liu & Debra, 2008; Perelli-Harris & Styrc, 2018; Perelli-Harris et al., 2019), with healthier behaviors that may translate into better sleep. Marriage also provides a sense of stability and security that may lead to sounder sleep (Berrington et al., 2015). In contrast, cohabitors who are relatively disadvantaged in socioeconomic conditions and health could face more anxieties and stressors, particularly after the birth of a child since children demand more care and financial resources.

Gender differentials in sleep hours and quality may also differ by

partnership, and change over the transition to parenthood, reflecting a shift of gender roles and economic conditions. At the beginning of the relationship, married men and women may begin to slip into conventional gender roles, with husbands focusing more on career progression, and wives stepping away from the labor market in anticipation of childbearing (Baxter et al., 2010; Musick et al., 2020). Cohabitors are more inclined to equal gender expectations. After the entrance into parenthood, gender specialization is often intensified. We would expect specialization to be even more pronounced for married people. Prior research has indicated that married couples tend to be more conservative, with a more distinct gender division of labor (Baxter et al., 2010; Chao, 2022). Married fathers are likely to spend more or at least the same time on work thereby achieving a fatherhood premium (Hodges & Budig, 2010; Killewald, 2013), while married mothers tend to reduce working hours and engage in housework and intensive motherhood, which could have a knock-on effect on mother's leisure and sleep (Craig & Mullan, 2011; Pepin et al., 2018; Stone & Lovejoy, 2019).

On the contrary, because cohabitors also tend to work in low-income jobs, cohabiting fathers are less likely to be the sole breadwinner and cohabiting mothers are more likely to stay in the labor force to meet financial needs (Chao, Berrington et al., 2020; Edin & Nelson, 2013). Therefore, rather than specializing, cohabiting parents may be more likely to share the additional burden after the birth of a child. Cohabiting mothers may be less "protective" of their partners' sleep because they also must return to work. Cohabiting fathers may face greater anxieties, struggling to pay for the costs of raising a child. Cohabiting men and women may both suffer from work and family stress and anxiety, particularly because their incomes are not particularly high (Kennedy & Bumpass, 2008; Perelli-Harris et al., 2010), potentially leading to more sleep problems (Arber et al., 2009; Maume et al., 2018; Meadows & Arber, 2012).

Finally, the additional disadvantages faced by cohabitors itself may affect pregnancy and birth outcomes. Because cohabitation is often associated with poverty, cohabitors may have pre-term babies with low birthweight (Zeitlin et al., 2002), who may wake more frequently and require greater nighttime care, thereby disrupting sleep (Lee & Kimble, 2009; McDonald et al., 2014). These sleep disruptions would be most likely to disturb both partners' sleep, leading to fewer sleep hours and worse sleep quality for cohabiting men and women after becoming parents.

Overall, while we expect both married and cohabiting women to experience sleep loss due to caring responsibilities, we expect married men to experience less of a decline after birth than cohabiting men. As a result, the differential in sleep loss for married men and women will be wider than that for cohabiting men and women. Therefore, we expect that *the gender gap in the loss in sleep hours (H2a) and quality (H2b) is larger between married women and men than between cohabiting women and men*.

3. Data and method

3.1. Data and sample

Longitudinal data from the UK Understanding Society (UKHLS) are ideally suited to examine changes in sleep upon entrance into parenthood. The UKHLS is a nationally representative longitudinal household survey (University of Essex, 2019). It started in 2009 by randomly selecting over 30,000 households and collecting information about all residents. Since then, it has annually followed the sample members' life courses, also collecting data from people living with them (see Institute for Social & Economic Research, 2020 for more details).

We use waves 1 (2009–2010), 4 (2012–2013), and 7 (2015–2016) which all include questions about sleep hours and sleep quality. The sample consists of individuals in married or cohabiting relationship who experience a first birth within a three-year window: either between wave 1 and 4, *or* between wave 4 and 7.[1] We only include individuals who remain together with their partner to observe the direct effect of partnership on sleep hours and quality. We do not include those who separate from their partner in this three-year window because relationship disruptions bring emotional, economic, and environmental changes that could additionally impact sleep. The sample size is 1,020. Because the missing cases for all variables in analyses are negligibly small, we used list-wise deletion to deal with missing data except for employment status and birthweight (see measurement section). The final sample size is 944 for models of sleep hours, and is 951 for models of sleep quality.

The sample includes men and women who report being in a couple relationship, but both partners need not have answered the questionnaire. We also conduct robustness checks (results upon request) on a sub-sample of respondents in which both partners answered the questionnaire. The robustness checks yield the same conclusions; however, due to the smaller number of couple dyads (about 370), we choose to present the findings from the main sample.

Note that this study is not concerned with the general effects of parenthood on sleep, which is known to differ between parents and non-parents (Burgard & Ailshire, 2013). Instead, we are interested in *changes in sleep* among those who become parents. Therefore, we follow individuals as they enter parenthood.

3.2. Dependent variables

Sleep hours is measured in waves 1, 4, and 7 with the question "How many hours of actual sleep did you usually get at night during the last month?" We identify number of hours of sleep before birth (either in wave 1 or wave 4) and after birth (either in wave 4 or wave 7).

Sleep quality is reported in waves 1, 4, and 7 in response to the question "During the past month, how would you rate your sleep quality overall?" measured on a scale of 1–4 (very bad, fairly bad, fairly good, very good). For simplicity, we present combined results for sleep quality before and after birth in Table 1.

We describe how these independent variables are recoded for each model in the method section.

3.3. Independent variables

Gender includes men and women

Partnership status is measured at first observation and in the follow-up wave after birth. It includes remaining married, remaining cohabiting, and transitioning from cohabitation to marriage between waves (over the three years). We do not distinguish between whether the birth or marriage came first for those who change their partnership status. However, given that these decisions are often made jointly (Musick & Bumpass, 2012), we speculate that those who married during the three-year period are more similar to those who married before birth.

Own employment status and *partner's employment status* consist of full-time, part-time, unemployed, and not in the labor force (e.g. homemaker, on maternity leave). In order to include those who have missing values in the partner's employment status (about 12% of the sample), a missing category is included. *Change in own and partner's employment status* are coded as remain the same, increase in working hours, decrease

[1] We run a robustness check where we exclude women who are pregnant at the initial observation. About 7% had a child within 9 months of the interview. Excluding this group leads to the same conclusions so we do not drop them from models to increase overall sample size.

in working hours, and missing. Remain the same refers to no change in employment status before and after birth; increase in working hours refers to moving up to a category of employment status, such as changing from not working to part/full time employed, or from part-time to full-time employed; decrease in working hours refers to moving down to a category of employment status, such as changing from full/part time employed to not working or from full-time to part-time employed.

Household income is a monthly gross income measured in thousands of GB pounds. *Change in household income* is measured by household income before parenthood minus the income after the first birth.

Self-rated health evaluates individuals' health conditions (Geiger et al., 2012), which often interfere with sleep. Due to the small sample size of category of poor, we combine poor with fair and code self-rated health as poor/fair, good, very good, and excellent. *Change in health* measures any change in self-rated health after birth, coded as remains the same, increase in self-rated health, and decrease in self-rated health.

Age. Prior studies have found strong associations between age and sleep, with younger people more likely to sleep longer and have better sleep quality (Burgard & Ailshire, 2013).[2] Here we included age as a continuous variable (Krueger & Friedman, 2009).

Education was coded as less than university degree versus university degree.

Ethnicity is coded as White and non-White because prior studies (in the US) have found that those of Black and ethnic minority status have worse sleep quality than Whites (Petrov & Lichstein, 2016; Walsemann et al., 2017).

Survey wave controls for period effects and the sample attrition that occurs over time. It is coded as having a birth between waves 1–4 or between waves 4–7.

Number of children is included, because people could have more than one child within the three-year period. This measure also captures those who had twins or adopted children.

Age of youngest child and breastfeeding status are likely to affect sleep hours and quality, as younger children are more likely to interrupt sleep, and only women breastfeed (although fathers could give the baby a bottle in the middle of the night). Because the question on breastfeeding was only asked when children were less than one year old, these factors are combined in one variable. Thus the categories are youngest child's age 0–1 and not currently breastfeeding, child's age 0–1 and currently breastfeeding, child's age 0–1 and breastfeeding status unknown, and child's age 2–3 and breastfeeding status unknown.[3]

Children's birthweight sometimes reflects children's underlying health conditions that could be related to parents' sleep and confound the main independent variables. Due to a large proportion of missing values, we code birthweight of the youngest child as below 2.5 kg, 2.5–4 kg, 4 kg above, and missing.

See the distribution of all variables in Table 1.

3.4. Methods

This study investigates changes in sleep quantity and quality during the transition to parenthood. We begin by presenting models that show the baseline of sleep hours and quality before and after entrance into parenthood, which helps us to understand absolute levels of change in sleep for men and women by partnership status. We use OLS regression for sleep quantity, because hours of sleep is a continuous variable.

[2] Although age changes between waves, and in rare cases education too, we nonetheless include the values of the pre-birth wave to account for differences in the amount of sleep loss.

[3] The number of times baby wakes at night was asked of those whose newborn was less than one year old. However, because models restricted to this sample indicate no differences from the main results, we do not include it in the presented models.

Table 1
Descriptive table for variables in analyses. Analyses are weighted.

	% or Mean (SD)	
	Sleep hours	Sleep quality
Baseline models predicting sleep before and after childbirth		
Before birth	7.23 (1.06)	
Before birth (%)		
Bad		14.18
Good		85.82
N	998	1,004
After birth	6.60 (1.25)	
After birth (%)		
Bad		24.32
Good		75.68
N	1,017	1,018
Models predicting change in sleep		
Change in sleep hours	0.63 (1.39)	
Change in sleep quality (%)		
Remain the same or improved		79.85
From good to bad		20.15
Gender (%)		
Men	51.51	51.18
Women	48.49	48.82
Partnership status (%)		
Married	60.63	60.19
Cohabiting	20.62	21.12
Cohabiting → married	18.75	18.69
Age	30.24 (5.21)	30.19 (5.24)
Education (%)		
Less than college degree	63.74	63.74
College degree	36.26	36.26
Change in own employment (%)		
Remain the same	59.93	59.87
Increase in working hours	7.08	7.09
Decrease in working hours	31.99	32.06
Missing	0.99	0.99
Change in partner's employment (%)		
Remain the same	50.61	50.79
Increase in working hours	4.91	5.08
Decrease in working hours	27.68	27.49
Missing	16.08	16.64
Change in household income (£1000)	-0.29 (6.53)	-0.29 (6.50)
Change in self-rated health (%)		
Remain the same	50.96	50.88
Increase in self-rated health	23.02	22.98
Decrease in self-rated health	26.02	26.14
Number of children	1.18 (0.42)	1.18 (0.42)
Age of child and breastfeeding status (%)		
Age 0–1 and not currently breastfeeding	29.87	29.89
Age 0–1 and currently breastfeeding	6.14	6.33
Age 0–1 and breastfeeding status unknown	34.19	33.94
Age 2–3 and breastfeeding status unknown	29.80	29.84
Birthweight (%)		
Below 2.5 kg	2.91	3.09
2.5–4 kg	37.37	37.45
4 kg above	7.05	7.13
Missing	52.67	52.33
Ethnicity (%)		
White	90.73	90.83
Non-White	9.27	9.17
Survey wave (%)		
Wave 1–4	60.73	60.90
Wave 4–7	39.27	39.10
N	944	951

Note. We use listwise deletion to deal with missing data so the sample size varies slightly according to which outcome and method used.

Table 2
Coefficients from OLS regression model predicting the level of sleep hours before (Model 1a) and after (Model 2a) the first birth and odds ratios from logistic regression predicting whether the individual had good sleep quality before (Model 2a) and after (Model 2b) the first birth.

	Sleep Hours (# of daily hours; OLS)		Sleep Quality (has good sleep; Logit)	
	Before Birth (1a)[2]	After Birth (2a)[3]	Before Birth (1b)[2]	After Birth (2b)[3]
Women	0.273**	-0.100	0.762	1.676
	(0.077)	(0.267)	(0.191)	(1.440)
Partnership (rf. Married)				
Cohabiting	-0.028	-0.229	1.064	1.028
	(0.126)	(0.149)	(0.343)	(0.302)
Cohabiting → married[1]	-0.052	-0.160	0.850	0.636+
	(0.097)	(0.132)	(0.240)	(0.168)
N	998	1,017	1,004	1,018

Note. 1. We recognize that in the "before birth" models, the category of cohabiting → married conditions on a future event. However, a sensitivity analysis, which only contrasts cohabitors with married people, yields the same conclusion. 2. The "before birth" models include covariates such as education, own and partner's employment, household income, self-rated health, age, race, and survey waves. 3. In addition to the controls included in the "before birth" models, the "after birth" models incorporate additional covariates, like number of children, age of youngest child and breastfeeding, and children's birthweight. ** $p < 0.01$, * $p < 0.05$, + $p < 0.1$. Robust standard errors in parentheses.

Although our measure of sleep quality is categorical, we reduce the categories to form a binary variable and use logistic regression. Very bad and fairly bad are coded as bad (0) and fairly good and very good are coded as good (1).

We next present change models, which directly compare change (loss) in sleep quantity and quality before and after birth. Again, we use OLS models for sleep quantity; loss in sleep hours is measured by the number of sleep hours before first birth *minus* the number of sleep hours after becoming a parent. Sleep quality was again collapsed into a binary indicator and analysed with logistic regression models. However, in these models loss in sleep quality is measured by a decline, from very/fairly good to fairly/very bad or a decline from fairly bad to very bad, coded as 1, and otherwise coded as 0.[4]

Note that all models take account of clustering of respondents within couples. Also, longitudinal weights provided in wave 4 and 7 (the waves after the birth) are used. These weights adjust for unequal selection probabilities, differential nonresponse, and potential sampling error, and are used to make the results nationally representative (Institute for Social & Economic Research, 2020).

Although it is common to use random effects (RE) or fixed effects (FE) models for panel data in which respondents are followed over time, such an approach is not ideal here. First, RE models are unable to include covariates that are only measured at the second time point relevant to becoming a parent such as breastfeeding, birthweight, or number of children, which are very important for understanding sleep quality and quality after childbearing. In RE models, all of these variables would be set to 0 before birth and directly compared to any values after birth; however, the comparison group should be compared within the after birth group, not to their null status at time 1. For example, everyone would have a value of 0 for breastfeeding before birth, and those who reported breastfeeding after birth would be coded as 1. However, the comparison should not be between before birth (when no one breastfed) and whether they breastfed after birth, but instead between those who were or were not breastfeeding after birth. Second, FE models can include time invariant variables only when they interact with time-varying variables. Our key variables of interest – gender and partnership – could be interacted in fixed-effect models; however, the results would be more complicated to interpret, especially given the other important time-invariant factors. Nevertheless, our research design can overcome these weaknesses, being able to incorporate a range of factors which only occur after birth and could influence sleep hours and quality, as well as to provide a more intuitive interpretation for the coefficients of gender and partnership status. In sensitivity analyses, RE models (Appendix 1) and FE models (Appendix 2) provide consistent results with our models although they do not control after-birth factors.

4. Results

4.1. Sleep hours and quality before and after becoming a parent

To thoroughly understand the change in sleep after transition to parenthood, we first describe the level of sleep hours and quality before and after having the first child. Table 2 Model 1a presents the results from OLS models predicting sleep hours before the birth of the first child. Net of covariates, partnered women sleep more hours than men, while partnership status is not associated with sleep hours. Following entry into parenthood, sleep hours do not differ by gender or partnership status (Table 2, Model 2a).

Moving on to sleep quality, Model 1b (Table 2) shows that the odds of having good sleep quality prior to parenthood do not differ by gender or partnership status. Similarly, following entry into parenthood, there are no differences in sleep quality between men and women. Note that women's odds of experiencing good sleep quality after birth are 45% lower than men's if the model excludes number of children, age of youngest child and breastfeeding, and children's birthweight (results upon request). That suggests after birth, women have poorer sleep because of childcare disruptions such as breastfeeding. Additionally, the odds of getting good sleep do not differ according to whether the individual is in a marital or cohabiting partnership, except that those who transition from cohabitation to marriage in the three years have a marginally lower likelihood of experiencing good sleep quality compared to married people ($p < 0.1$).

Fig. 1 presents interactions indicating whether gender differences in sleep vary by partnership status (See the full models in Appendix 3). The upper left panel shows that net of covariates, married women sleep an additional 0.331 hours more than married men before birth, while cohabiting women and men have similar sleep hours. Thus, the gender gap for sleep hours before birth is pronounced for married people and those who are about to marry, but is less evident for cohabiting people, whose average sleep hours fall in between married men and women. The lower left panel shows that after birth, the number of sleep hours for married women does not differ from married men net of covariates. There is no gender gap in sleep hours for cohabitors and those who are

[4] We try alternative specifications for changes in sleep quality, for example coding sleep quality as remaining the same, increasing, and decreasing. Because results are similar and we are primarily interested in the extent to which respondents' sleep deteriorates, we prefer the binary measurement to the nominal measurement.

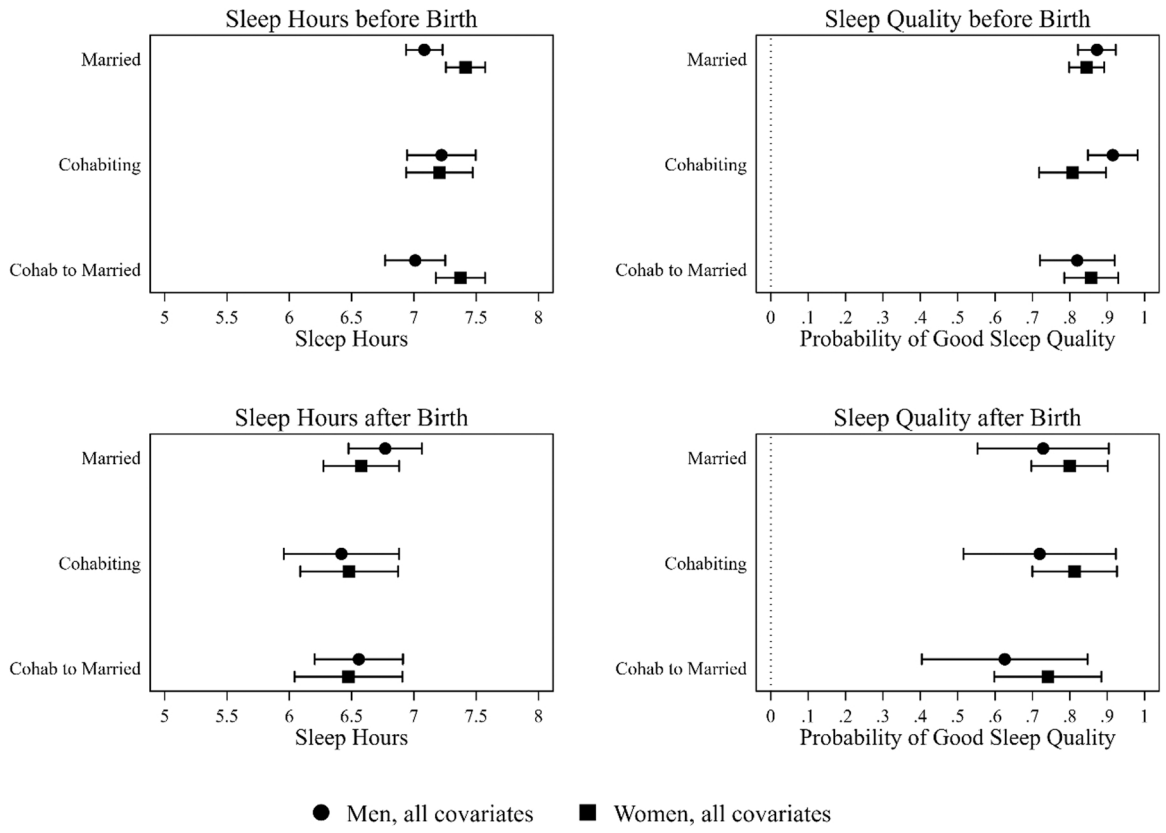


Fig. 1. Gender differential in sleep hours and quality before and after the first birth by partnership status.

cohabiting and then marry either. However, although it is marginal, cohabiting men report fewer sleep hours than married men ($p < 0.1$).

In terms of sleep quality, the right panel of Fig. 1 shows that either before or after birth, men and women enjoy the same level of sleep quality regardless of partnership status when all covariates are included.

4.2. Change in sleep hours and quality when becoming a parent

Table 3 presents coefficients and odds ratios for the change models predicting loss in sleep hours and quality following entry into parenthood. Model 1 shows that entry into parenthood results in a larger decline in sleep hours for women than for men of 0.724 hours. In an additional analysis (Appendix 4), we include an interaction between gender and age of youngest child, which indicates that the loss in sleep hours is greatest for women with younger children. Thus, the characteristics of the child make a large difference in how much sleep loss women have experienced, with the greatest decline in the first year. Cohabiting individuals experience the same loss in sleep hours as married people when we do not include gender differences; the difference in sleep loss between married and cohabiting people is not significant.

In Table 3 Model 2, we investigate decline in sleep quality. After taking into account all covariates, women are likely to suffer as much loss of sleep quality as men over the transition to parenthood. Moreover, the odds of moving from good to bad sleep quality are not significantly different between cohabitors and married people. However, individuals who are cohabiting and transition to marriage experience slightly higher odds of moving from good to bad sleep quality than their married counterparts, but this is only marginally significant ($p < 0.1$).

In sum, women experience a greater loss in sleep hours than men after birth, even when other observed factors are included. However, this is not the case for sleep quality: women's probability of experiencing worse sleep quality is the same as men's. These results largely support Hypothesis 1a but not 1b.

With regards to covariates, an improvement in health condition is associated with less of a loss in sleep hours. Not surprisingly, caring responsibilities, such as the number of children and breastfeeding, are positively associated with the loss in sleep hours and sleep quality after birth.

Fig. 2 presents the marginal effects for the loss in sleep hours and decline in sleep quality for men and women across partnership status (full models shown in Appendix 5). The left panel shows that all women, regardless of partnership status, lose an average of an hour at night following the first birth, net of covariates. However, married men, including men who marry after the first wave of observation, do not experience a significant loss in sleep hours. Cohabiting men, on the other hand, experience 0.5 hours greater decline than married men. The gender difference in sleep hours loss is larger for married individuals than for cohabiting individuals, due to cohabiting men being particularly likely to lose sleep after the birth of a child.

The right panel in Fig. 2 shows all parents significantly experience a decline from good to bad sleep quality when having the first child. Cohabiting women and cohabiting men experience the same level of loss in sleep quality net of covariates. Similarly, married women have the same probability as married men of reduced sleep quality.

However, as excluding number of children, age of youngest child and breastfeeding, and children's birthweight from the model, married women have 95% higher odds to experience a decline in sleep quality than married men (results upon request). This suggests that married women's greater loss in sleep quality appears to be associated with their additional caring responsibilities and characteristics of the child.

Overall, both H2a and H2b, where we hypothesized that the loss in sleep hours and quality is larger between married women and married men than between cohabiting women and men, are supported.

Table 3
Coefficients from OLS regression model predicting *loss* in sleep hours and odds ratios from logistic regression predicting whether the individual experienced *loss* in sleep quality after the first birth.

	Loss in Sleep Hours (OLS)	Loss in Sleep Quality (Logit)
	(1)	(2)
Women	0.724*	0.961
	(0.337)	(0.905)
Partnership (rf. Married)		
Cohabiting	0.207	1.035
	(0.158)	(0.345)
Cohabiting → married	0.109	1.594 +
	(0.150)	(0.427)
Change in own employment (rf. Remain the same)		
Increase in working hours	0.070	1.577
	(0.225)	(0.703)
Decrease in working hours	-0.042	1.177
	(0.144)	(0.323)
Missing	0.124	2.552
	(0.476)	(1.850)
Change in partner's employment (rf. Remain the same)		
Increase in working hours	0.144	0.943
	(0.359)	(0.543)
Decrease in working hours	-0.238 +	0.994
	(0.142)	(0.314)
Missing	-0.129	1.080
	(0.146)	(0.296)
Change in household income (£1000)	-0.003	0.975
	(0.005)	(0.029)
Change in self-rated health (rf. Remain the same)		
Increase in self-rated health	-0.306*	0.860
	(0.140)	(0.220)
Decrease in self-rated health	0.066	1.219
	(0.124)	(0.297)
# of children	0.445*	2.432**
	(0.211)	(0.630)
Breastfeeding (rf. Age 0–1 and not currently breastfeeding)		
Age 0–1 and currently breastfeeding	0.817*	2.034 +
	(0.321)	(0.757)
Age 0–1 and breastfeeding status unknown	-0.191	0.838
	(0.138)	(0.228)
Age 2–3 and breastfeeding status unknown	-0.330*	0.709
	(0.149)	(0.213)
Birthweight (rf. Below 2.5 kg)		
2.5–4 kg	-0.309	0.855
	(0.417)	(0.494)
4 kg above	-0.493	0.318 +
	(0.461)	(0.218)
Missing	0.278	0.481
	(0.518)	(0.514)
Age	-0.005	0.988
	(0.012)	(0.024)
Less than college degree (rf College degree)	0.137	0.850
	(0.115)	(0.205)
Non-White (rf White)	-0.121	0.536 +
	(0.206)	(0.199)
Survey wave 4–7 (rf. Survey wave 1–4)	-0.184	1.252
	(0.116)	(0.284)
Constant	0.157	0.165
	(0.741)	(0.240)
N	944	951

**p < 0.01, * p < 0.05, + p < 0.1. Robust standard errors in parentheses.

5. Conclusions and discussion

Sleep intertwines with social roles embedded in individuals' daily lives (Hislop & Arber, 2003). Our study finds that sleep is a domain that reveals and reinforces gender inequalities, particularly upon entry into parenthood, when the division of housework and care becomes unequal (Baxter et al., 2008; Chao, 2022; Schober & Scott, 2012; Young & Schieman, 2018). We also find that partnership status, which is often associated with disadvantages, is another social role contributing to the inequality in sleep.

Our findings show that before becoming a parent, women report sleeping a quarter of an hour more than men, but report a similar level of sleep quality as men. After becoming a parent, women sleep as many hours as men, but their sleep quality is more likely to deteriorate due to childcare responsibilities. Our analyses indicate that following parenthood, women's sleep is compromised to a greater degree than men's. To some extent this is to be expected, particularly directly after a birth when women are more likely to wake to breastfeed. Controlling for age of child and breastfeeding does reduce gender differentials in loss of sleep quality, suggesting that the main impact on women is in the infant's early years. However, the gender differentials in *loss of sleep hours* are robust. The persistent impact suggests that even after taking into

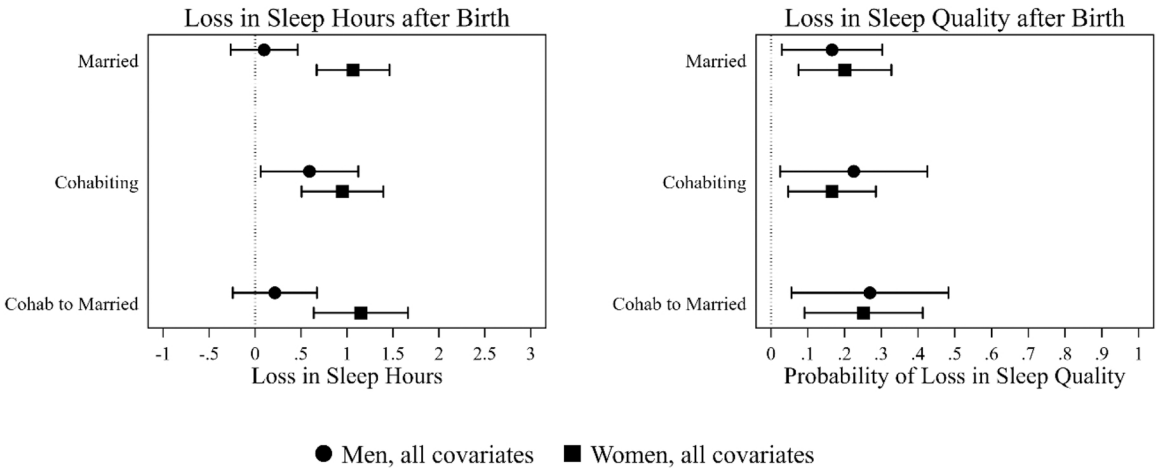


Fig. 2. Gender differential in the *loss* in sleep hours and quality after the first birth by partnership status.

account other life domains such as work, women lose more sleep hours when becoming a parent, even though biologically they may need more. This sleep deprivation may have a long-term effect on their health.

Given prior findings on the better health of married people (Musick & Bumpass, 2012; Perelli-Harris & Styrc, 2018), we had expected that on average cohabitors would sleep fewer hours and have worse sleep quality both before and after the birth. However, our findings show that there is no difference in sleep hours or sleep quality between married and cohabiting people. Only individuals who started off cohabiting and then married during the period of observation had marginally worse sleep quality after birth.

When we unpack our findings further to examine whether gender differentials vary according to partnership status, inequalities emerge. First, we find that before birth, married people have a larger gender difference in sleep hours, but not sleep quality, than cohabitors. Married women sleep more than married men, which may be because couples start to slip into conventional patterns of division of paid and unpaid work, even before having a child (Baxter et al., 2010; Chao, 2022). Cohabiting women and men, however, tend to sleep more similar hours, potentially because cohabiting women are working more intense hours due to their male partner's lower income and job instability (Chao, Ann et al., 2020; Edin & Nelson, 2013).

After birth, there is no gender gap in sleep hours and quality for both married and cohabiting people. However, gender differentials in *loss of sleep hours* are wider among married people than cohabitors, with married women experiencing a greater loss than married men, but cohabiting men experiencing the same loss as cohabiting women. Although we control for education and employment, the loss of sleep hours among cohabiting men is still profound, potentially due to unobserved factors that select people into having a birth while cohabiting. Cohabiting men may be more affected by uncertainties in the labor market, non-standard work schedules that lead to worse well-being (Liu et al., 2011), and poorer relationship quality (Perelli-Harris & Blom, 2021), as well as general disadvantages that disturb night sleep. The same processes that select men who cohabit into poor health (Perelli-Harris et al., 2018) and worse subjective well-being (Perelli-Harris et al., 2019), also seem to be associated with worse sleep after having a baby.

This study has several limitations. First, the longitudinal survey is subject to attrition, which could disproportionately affect those who are experiencing important life events such as marriage or childbearing. We lose a substantial proportion of couples over time and cannot determine if they have become parents. However, they may be more likely to encounter relationship disruption or economic hardship. Focusing on those who remain together may make our results more conservative, which could lead to underestimating inequality in sleep. Second, although the UKHLS is a household survey, we do not have enough observations of both partners to examine whether couples are congruent in their sleep behaviors. It would have been useful to know whether cohabiting men report similar sleep hours to their partners because they are taking on caring roles, or if they report less sleep for other reasons. Third, the indicators of sleep in this study are self-reported measures. Although the inclusion in sleep quantity and quality expands dimensions in the discussion of sleep in the existing literature, having more indicators, such as taking pills for sleep, will help further understand the association between sleep and social contexts. Future research could pay more attention on the topics. Additionally, the sleep measurements are taken over a three-year period over the transition to parenthood. A more consistent timing when the data was collected over the transition to parenthood (for instance always 1 year before birth and 3 months after) may reduce heterogeneity in the sample. Finally, although we control for basic socio-economic indicators, we do not model selection into remaining in a cohabiting partnership at the time of the birth. Unmeasured factors not captured in the survey could explain why cohabiting men lose so much sleep after entrance into fatherhood.

Despite the limitations, our findings provide important insights. While the entry into parenthood results in similar sleep hours and quality between new fathers and mothers, the *change* in sleep hours among mothers indicates that mothers carry the burden of increased caring responsibilities, even when they are working. This unique perspective implies that when discussing inequalities, we need to pay attention not only to static but also dynamic results, and that the questions used to measure sleep make a difference to our conclusions. But these findings also raise questions about the nature of the inequalities – have women experienced a greater decline in sleep hours because of the natural process of becoming a mother, or are they disadvantaged because their partners do not contribute to the "fourth shift"? Likewise, the finding for cohabiting men raises questions about inequalities and disadvantages – do cohabiting men experience a greater decline in sleep because they are helping their partner with nighttime childcare, or because they are worried about economic and relationship instability? Future research needs to uncover more about the source of these inequalities.

Acknowledgement

The authors would like to thank reviewers and the editor for their valuable comments. This research was funded by the ESRC Centre for Population Change grant number ES/R009139/1.

Appendix 1. Random-effect models predicting sleep hours (coefficients from OLS) and quality (odds ratios from logistic regression) as transition to parenthood by gender and partnership status

	Sleep Hours (# of daily hours)			Sleep Quality (has good sleep)		
	(1a)	(2a)	(3a)	(1b)	(2b)	(3b)
Transition to parenthood	-0.331**	-0.384**	-0.169	0.600 +	0.524**	0.665
	(0.094)	(0.090)	(0.107)	(0.157)	(0.129)	(0.208)
Women	0.261**	0.162*	0.326**	0.819	0.705 +	0.828
	(0.079)	(0.072)	(0.098)	(0.185)	(0.134)	(0.241)
Transition to parenthood * Women	-0.318**		-0.466**	0.692		0.635
	(0.104)		(0.127)	(0.206)		(0.242)
Partnership (rf. Married)						
Cohabiting	-0.134 +	-0.005	0.160	1.046	1.001	1.514
	(0.079)	(0.099)	(0.133)	(0.204)	(0.277)	(0.629)
Cohabiting → married	-0.121	-0.031	-0.047	0.690 +	0.835	0.580
	(0.079)	(0.100)	(0.143)	(0.131)	(0.233)	(0.226)
Transition to parenthood * Cohabiting		-0.254*	-0.547**		1.074	0.640
		(0.114)	(0.156)		(0.354)	(0.317)
Transition to parenthood * Cohabiting → married		-0.178	-0.194		0.729	1.050
		(0.119)	(0.170)		(0.246)	(0.505)
Women * Cohabiting			-0.340 +			0.469
			(0.189)			(0.255)
Women * Cohabiting → married			0.010			2.015
			(0.197)			(1.128)
Transition to parenthood * Women * Cohabiting			0.614**			2.603
			(0.227)			(1.747)
Transition to parenthood * Women * Cohabiting → married			0.074			0.498
			(0.237)			(0.339)
Own employment (rf. Full time)						
Part time	0.258**	0.168*	0.254**	1.164	1.081	1.183
	(0.082)	(0.077)	(0.082)	(0.253)	(0.224)	(0.259)
Unemployed	0.006	-0.039	0.008	0.789	0.753	0.770
	(0.150)	(0.150)	(0.150)	(0.305)	(0.289)	(0.300)
Not in the labor force	-0.216*	-0.315**	-0.212*	0.641 +	0.593*	0.658 +
	(0.101)	(0.096)	(0.101)	(0.158)	(0.140)	(0.164)
Partner's employment (rf. Full time)						
Part time	0.157 +	0.212*	0.137	1.041	1.114	1.003
	(0.085)	(0.083)	(0.085)	(0.247)	(0.259)	(0.240)
Unemployed	-0.100	-0.044	-0.101	0.780	0.844	0.810
	(0.154)	(0.153)	(0.154)	(0.314)	(0.335)	(0.327)
Not in the labor force	-0.044	0.035	-0.062	0.747	0.826	0.730
	(0.095)	(0.091)	(0.095)	(0.185)	(0.197)	(0.183)
Missing	-0.011	-0.001	-0.028	0.927	0.940	0.901
	(0.086)	(0.086)	(0.086)	(0.203)	(0.206)	(0.201)
Household income (£1000)	-0.004	-0.003	-0.004	0.958*	0.959*	0.958*
	(0.005)	(0.005)	(0.005)	(0.018)	(0.019)	(0.019)
Self-rated health (rf. Poor/fair)						
Good	0.262*	0.268*	0.265*	2.251**	2.246**	2.304**
	(0.115)	(0.115)	(0.115)	(0.590)	(0.588)	(0.609)
Very good	0.490**	0.497**	0.496**	4.602**	4.577**	4.736**
	(0.112)	(0.112)	(0.111)	(1.206)	(1.198)	(1.254)
Excellent	0.595**	0.600**	0.594**	3.829**	3.802**	3.870**
	(0.119)	(0.119)	(0.119)	(1.075)	(1.067)	(1.097)
Age	-0.022**	-0.021**	-0.022**	1.012	1.012	1.011
	(0.006)	(0.006)	(0.006)	(0.016)	(0.016)	(0.016)
Less than college degree (rf. College degree)	-0.047	-0.045	-0.050	0.864	0.866	0.864
	(0.065)	(0.065)	(0.065)	(0.141)	(0.141)	(0.142)
Non-White (rf White)	-0.030	-0.033	-0.029	1.265	1.248	1.260
	(0.103)	(0.104)	(0.103)	(0.332)	(0.326)	(0.333)
Survey wave 4–7 (rf. Survey wave 1–4)	-0.036 +	-0.038 +	-0.037 +	0.985	0.984	0.983
	(0.020)	(0.020)	(0.020)	(0.049)	(0.049)	(0.050)
Constant	7.481**	7.467**	7.411**	2.880 +	2.971 +	2.812 +
	(0.243)	(0.244)	(0.247)	(1.741)	(1.804)	(1.759)
N		2,015			2,022	

**p < 0.01, * p < 0.05, + p < 0.1. Robust standard errors in parentheses.

Appendix 2. Fixed-effect models predicting sleep hours (coefficients from OLS) and quality (odds ratios from logistic regression) as transition to parenthood by gender and partnership status

	Sleep hours (# of daily hours)	Sleep quality (has good sleep)
Transition to parenthood	-0.331**	0.549*

(*continued on next page*)

(*continued*)

	Sleep hours (# of daily hours)	Sleep quality (has good sleep)
	(0.073)	(0.159)
Transition to parenthood * Women	-0.419**	0.778
	(0.129)	(0.293)
Transition to parenthood * Remain cohabiting	-0.570*	0.743
	(0.239)	(0.393)
Transition to parenthood * Cohabiting → married	-0.203	1.135
	(0.160)	(0.542)
Transition to parenthood * Women * Remain cohabiting	0.603 +	2.213
	(0.333)	(1.518)
Transition to parenthood * Women * Cohabiting → married	0.035	0.473
	(0.263)	(0.743)
N	2,015	2,022

** $p < 0.01$, * $p < 0.05$, + $p < 0.1$. Robust standard errors in parentheses.

Appendix 3. Interaction between gender and partnership status: Coefficients from OLS regression model predicting the level of sleep hours before (Model 1a) and after (Model 2a) the first birth and odds ratios from logistic regression predicting whether the individual had good sleep quality before (Model 1b) and after (Model 2b) the first birth

	Sleep Hours (# of daily hours; OLS)		Sleep Quality (has good sleep; Logit)	
	Before Birth (1a)	After Birth (1b)	Before Birth (2a)	After Birth (2b)
Women	0.331**	-0.191	0.784	1.566
	(0.094)	(0.280)	(0.238)	(1.365)
Partnership (rf. Married)				
Cohabiting	0.138	-0.351 +	1.612	0.948
	(0.168)	(0.200)	(0.850)	(0.385)
Cohabiting → married	-0.073	-0.211	0.645	0.581
	(0.138)	(0.149)	(0.285)	(0.216)
Women * Cohabiting	-0.348	0.252	0.467	1.164
	(0.215)	(0.263)	(0.286)	(0.589)
Women * Cohabiting → married	0.031	0.108	1.720	1.180
	(0.171)	(0.213)	(0.998)	(0.489)
Own employment (rf. Full time)				
Part time	0.093	0.257*	0.900	1.251
	(0.146)	(0.124)	(0.302)	(0.373)
Unemployed	0.253	-0.437	0.958	0.687
	(0.343)	(0.442)	(0.585)	(0.434)
Not in the labor force	0.076	0.008	1.055	0.926
	(0.274)	(0.179)	(0.505)	(0.279)
Partner's employment (rf. Full time)				
Part time	-0.047	0.177	0.997	0.991
	(0.122)	(0.136)	(0.438)	(0.323)
Unemployed	0.045	-0.427	2.236	0.359 +
	(0.345)	(0.569)	(1.449)	(0.208)
Not in the labor force	-0.024	-0.000	1.083	0.723
	(0.206)	(0.170)	(0.573)	(0.250)
Missing	-0.182	0.047	0.947	1.033
	(0.142)	(0.152)	(0.326)	(0.285)
Household income (£1000)	-0.002	-0.004	0.957	0.968
	(0.015)	(0.006)	(0.035)	(0.026)
Self-rated health (rf. Poor/fair)				
Good	0.164	0.554*	2.096 +	2.408*
	(0.307)	(0.265)	(0.810)	(0.856)
Very good	0.519 +	0.698**	5.578**	3.791**
	(0.301)	(0.257)	(2.133)	(1.272)
Excellent	0.578 +	0.852**	4.995**	2.673**
	(0.311)	(0.262)	(2.180)	(0.964)
# of children		-0.367*		0.454**
		(0.168)		(0.107)
Breastfeeding (rf. Age 0–1 and not currently breastfeeding)				
Age 0–1 and currently breastfeeding		-0.602*		0.381*
		(0.254)		(0.144)
Age 0–1 and breastfeeding status unknown		0.097		0.952
		(0.127)		(0.254)
Age 2–3 and breastfeeding status unknown		0.315*		0.957
		(0.135)		(0.279)
Birthweight (rf. Below 2.5 kg)				
2.5–4 kg		0.055		1.028
		(0.306)		(0.602)
4 kg above		-0.055		1.697

(*continued on next page*)

(*continued*)

	Sleep Hours (# of daily hours; OLS)		Sleep Quality (has good sleep; Logit)	
	Before Birth (1a)	After Birth (1b)	Before Birth (2a)	After Birth (2b)
		(0.352)		(1.127)
Missing		-0.018		3.122
		(0.396)		(3.159)
Age	-0.023 +	-0.026*	1.012	1.005
	(0.012)	(0.010)	(0.025)	(0.023)
Less than college degree (rf. College degree)	0.005	-0.102	0.615 +	1.201
	(0.094)	(0.110)	(0.165)	(0.275)
Non-White (rf. White)	-0.093	-0.004	0.894	1.485
	(0.157)	(0.175)	(0.283)	(0.454)
Survey wave 4–7 (rf. Survey wave 1–4)	-0.067*	-0.003	1.096	0.928
	(0.033)	(0.033)	(0.092)	(0.066)
Constant	7.519**	7.289**	1.726	2.125
	(0.374)	(0.641)	(1.668)	(2.998)
N	998	1,017	1,004	1,018

** $p < 0.01$, * $p < 0.05$, + $p < 0.1$. Robust standard errors in parentheses.

Appendix 4. Interaction between gender and age of youngest child: Coefficients from OLS regression model predicting *loss* in sleep hours and odds ratios from logistic regression predicting whether the individual experienced *loss* in sleep quality after the first birth

	Loss in sleep hours (OLS)	Loss in sleep quality (Logit)
Women	0.817*	0.959
	(0.401)	(1.002)
Age of the youngest child (rf. <12 months)		
12–24 months	-0.200	0.622
	(0.262)	(0.393)
> 24 months	-0.245	0.633
	(0.269)	(0.429)
Women*12–24 months	-0.479 +	1.402
	(0.267)	(0.673)
Women*> 24 months	-0.611*	1.090
	(0.287)	(0.599)
Partnership (rf. Married)		
Cohabiting	0.474*	1.543
	(0.213)	(0.699)
Cohabiting → married	0.146	1.989
	(0.181)	(0.833)
Women*Cohabiting	-0.580 +	0.508
	(0.303)	(0.280)
Women*Cohabiting → married	-0.128	0.700
	(0.263)	(0.347)
Change in own employment status (rf. Remain the same)		
Increase in working hours	0.065	1.557
	(0.221)	(0.689)
Decrease in working hours	-0.068	1.169
	(0.143)	(0.325)
Missing	0.026	2.556
	(0.459)	(1.928)
Change in partner's employment (rf. Remain the same)		
Increase in working hours	0.123	0.910
	(0.361)	(0.535)
Decrease in working hours	-0.185	0.981
	(0.135)	(0.312)
Missing	-0.106	1.108
	(0.142)	(0.302)
Change in household income (£1000)	-0.003	0.975
	(0.005)	(0.029)
Change in self-rated health (rf. Remain the same)		
Increase in self-rated health	-0.314*	0.856
	(0.140)	(0.216)
Decrease in self-rated health	0.046	1.230
	(0.124)	(0.303)
# of children	0.422*	2.522**
	(0.212)	(0.645)
Breastfeeding (rf. Currently not breastfeeding)		
Currently breastfeeding	0.553	2.249*
	(0.349)	(0.894)
Missing	0.111	1.105
	(0.218)	(0.565)

(*continued on next page*)

(*continued*)

	Loss in sleep hours (OLS)	Loss in sleep quality (Logit)
Birthweight (rf. Below 2.5 kg)		
2.5–4 kg	-0.357	0.850
	(0.419)	(0.492)
4 kg above	-0.584	0.319 +
	(0.460)	(0.218)
Missing	-0.248	0.434
	(0.606)	(0.513)
Age	-0.003	0.991
	(0.012)	(0.024)
Less than college degree (rf College degree)	0.132	0.853
	(0.116)	(0.208)
Non-White (rf White)	-0.101	0.548
	(0.205)	(0.204)
Survey wave 4–7 (rf. Survey wave 1–4)	-0.188	1.217
	(0.115)	(0.278)
Constant	0.525	0.156
	(0.798)	(0.235)
N	944	951

** $p < 0.01$, * $p < 0.05$, + $p < 0.1$. Robust standard errors in parentheses.

Appendix 5. Interaction between gender and partnership status: Coefficients from OLS regression model predicting *loss* in sleep hours and odds ratios from logistic regression predicting whether the individual experienced *loss* in sleep quality after the first birth

	Loss in Sleep Hours (OLS)	Loss in Sleep Quality (Logit)
Women	0.969**	1.291
	(0.364)	(1.198)
Partnership (rf. Married)		
Cohabiting	0.494*	1.510
	(0.213)	(0.677)
Cohabiting → married	0.117	1.957 +
	(0.177)	(0.798)
Women*Cohabiting	-0.610*	0.514
	(0.300)	(0.284)
Women*Cohabiting → married	-0.032	0.702
	(0.250)	(0.338)
Change in own employment (rf. Remain the same)		
Increase in working hours	0.077	1.601
	(0.227)	(0.702)
Decrease in working hours	-0.044	1.171
	(0.143)	(0.322)
Missing	0.125	2.492
	(0.469)	(1.869)
Change in partner's employment (rf. Remain the same)		
Increase in working hours	0.124	0.916
	(0.361)	(0.539)
Decrease in working hours	-0.204	1.023
	(0.135)	(0.322)
Missing	-0.091	1.112
	(0.144)	(0.304)
Change in household income (£1000)	-0.003	0.974
	(0.005)	(0.028)
Change in self-rated health (rf. Remain the same)		
Increase in self-rated health	-0.315*	0.850
	(0.139)	(0.214)
Decrease in self-rated health	0.049	1.203
	(0.124)	(0.296)
# of children	0.451*	2.409**
	(0.203)	(0.612)
Breastfeeding (rf. Age 0–1 and not currently breastfeeding)		
Age 0–1 and currently breastfeeding	0.810*	2.072*
	(0.324)	(0.765)
Age 0–1 and breastfeeding status unknown	-0.197	0.833
	(0.135)	(0.226)
Age 2–3 and breastfeeding status unknown	-0.346*	0.696
	(0.145)	(0.208)
Birthweight (rf. Below 2.5 kg)		
2.5–4 kg	-0.292	0.855
	(0.418)	(0.490)
4 kg above	-0.489	0.317 +
	(0.459)	(0.216)
Missing	0.395	0.511

(*continued on next page*)

(*continued*)

	Loss in Sleep Hours (OLS)	Loss in Sleep Quality (Logit)
	(0.534)	(0.532)
Age	-0.004	0.990
	(0.012)	(0.024)
Less than college degree (rf. College degree)	0.132	0.848
	(0.116)	(0.205)
Non-White (rf. White)	-0.104	0.545
	(0.204)	(0.203)
Survey wave 4–7 (rf. Survey wave 1–4)	-0.184	1.251
	(0.115)	(0.283)
Constant	-0.023	0.130
	(0.750)	(0.185)
N	944	951

** $p < 0.01$, * $p < 0.05$, + $p < 0.1$. Robust standard errors in parentheses.

References

Arber, S., Bote, M., & Meadows, R. (2009). Gender and socio-economic patterning of self-reported sleep problems in britain. *Social Science & Medicine, 68*(2), 281–289.

Basner, M., Fomberstein, K. M., Razavi, F. M., Banks, S., William, J. H., Rosa, R. R., & Dinges, D. F. (2007). American time use survey: Sleep time and its relationship to waking activities. *Sleep, 30*(9), 1085–1095.

Baxter, J., Hewitt, B., & Haynes, M. (2008). Life course transitions and housework: Marriage, parenthood, and time on housework. *Journal of Marriage and Family, 70*(2), 259–272.

Baxter, J., Haynes, M., & Hewitt, B. (2010). Pathways into marriage: Cohabitation and the domestic division of labor. *Journal of Family Issues, 31*(11), 1507–1529.

Baxter, J., Buchler, S., Perales, F., & Western, M. (2015). A life-changing event: First births and men's and women's attitudes to mothering and gender divisions of labor. *Social Forces, 93*(3), 989–1014.

Berk, S. F. (1985). *The gender factory: The apportionment of work in American households*. Plenum Press.

Berrington, A., Perelli-Harris, B., & Trevena, P. (2015). Commitment and the changing sequence of cohabitation, childbearing, and marriage: Insights from qualitative research in the UK. *Demographic Research, 33*, 327–362.

Bianchi, S. M. (2000). Maternal employment and time with children: Dramatic change or surprising continuity? *Demography, 37*(4), 401–414.

Burgard, S. A. (2011). The needs of others: Gender and sleep interruptions for caregivers. *Social Forces, 89*(4), 1189–1215.

Burgard, S. A., & Ailshire, J. A. (2009). Putting work to bed: Stressful experiences on the job and sleep quality. *Journal of Health and Social Behavior, 50*(4), 476–492.

Burgard, S. A., & Ailshire, J. A. (2013). Gender and time for sleep among U.S. adults. *American Sociological Review, 78*(1), 51–69.

Chao, S. (2022). Gender inequality in housework: Persistence and Change by partnership and parenthood status in the early 2000s. *Journal of Family Issues, 43*(10), 2647–2671.

Chao, Shih-Yi, Ann Berrington, Brienna and Perelli-Harris (2020). *Gender Attitudes and Practices among Married and Cohabiting Parents. Policy Briefing No.57, ESRC Centre for Population Change*. University of Southampton. http://cpc2.geodata.soton.ac.uk/docs/2020_PB57_Gender_attitudes_and_practices_among_parents.pdf.

Chao, Shih-Yi, Niels Blom, Ann Berrington, Brienna and Perelli-Harris (2020). *How Partnerships Have Changed in the UK Over the Last 30 Years. Policy Briefing No.50, ESRC Centre for Population Change*. University of Southampton. https://www.cpc.ac.uk/docs/2020_PB50_How_partnerships_have_changed_in_the_UK.pdf.

Chatzitheochari, S., & Arber, S. (2009). Lack of sleep, work and the long hours culture: Evidence from the UK time use survey. *Work, Employment and Society*.

Chen, J., Linda, J. W., & Lauderdale, D. S. (2015). Marriage, relationship quality, and sleep among U.S. older adults. *Journal of Health and Social Behavior, 56*(3), 356–377.

Chen, Y., Kawachi, I., Subramanian, S. V., Acevedo-Garcia, D., & Lee, Y. (2005). Can social factors explain sex differences in insomnia? Findings from a national survey in Taiwan. *Journal of Epidemiology and Community Health, 59*(6), 488–494.

Craig, L., & Mullan, K. (2011). How mothers and fathers share childcare: A cross-national time-use comparison. *American Sociological Review, 76*(6), 834–61.

Dzaja, A., Arber, S., Hislop, J., Kerkhofs, M., Kopp, C., Pollmächer, T., Polo-Kantola, P., Skene, G. J., Stenuit, P., Tobler, I., & Porkka-Heiskanen, T. (2005). Women's sleep in health and disease. *Journal of Psychiatric Research, 39*(1), 55–76.

Edin, K., & Nelson, T. J. (2013). Doing the best i can: Fatherhood in the inner city. *University of California Press*.

Evertsson, M. (2013). The importance of work: Changing work commitment following the transition to motherhood. *Acta Sociologica, 56*(2), 139–153.

Gangwisch, J. E., Malaspina, D., Boden-Albala, B., & Heymsfield, S. B. (2005). Inadequate sleep as a risk factor for obesity: Analyses of the NHANES I. *Sleep, 28*(10), 1289–1296.

Geiger, S. D., Sabanayagam, C., & Shankar, A. (2012). The relationship between insufficient sleep and self-rated health in a nationally representative sample. *Journal of Environmental and Public Health; Hindawi*.

Gottlieb, D. J., Redline, S., Javier Nieto, F., Baldwin, C. M., Newman, A. B., Resnick, H. E., & Punjabi, N. M. (2006). Association of usual sleep duration with hypertension: The sleep heart health study. *Sleep, 29*(8), 1009–1014.

Grinza, E., Devicienti, F., Rossi, M., & Vannoni, D. (2022). How entry into parenthood shapes gender role attitudes: New evidence from the UK (Online first) *Feminist Economics*.

Hagen, E. W., Mirer, A. G., Palta, M., & Peppard, P. E. (2013). The sleep-time cost of parenting: Sleep duration and sleepiness among employed parents in the Wisconsin sleep cohort study. *American Journal of Epidemiology, 177*(5), 394–401.

Hislop, J., & Arber, S. (2003). Sleepers wake! The gendered nature of sleep disruption among mid-life women. *Sociology, 37*(4), 695–711.

Hochschild, A., & Machung, A. (2012). *The Second Shift: Working Families and the Revolution at Home* (p. 352). Penguin.

Hodges, M. J., & Budig, M. J. (2010). Who gets the daddy bonus?: Organizational hegemonic masculinity and the impact of fatherhood on earnings. *Gender & Society, 24*(6), 717–745.

Institute for Social and Economic Research. (2020). *Understanding society: Waves 1-10, 2009-2019 and harmonised BHPS: Waves 1-18, 1991-2009, User Guide, 29 October 2020*. Colchester: University of Essex.

Ishizuka, P. (2018). The economic foundations of cohabiting couples' union transitions. *Demography, 55*(2), 535–557.

Jacobs, J. A., & Gerson, K. (2004). *The time divide*. Harvard University Press.

Kennedy, S., & Bumpass, L. L. (2008). Cohabitation and children's living arrangements: New estimates from the United States. *Demographic Research, 19*(47), 1663–1692.

Killewald, A. (2013). A reconsideration of the fatherhood premium: Marriage, coresidence, biology, and fathers' wages. *American Sociological Review, 78*(1), 96–116.

Kissling, A. (2020). Partnership and insomnia status among mothers. *Family Relations* (online version).

Krueger, P. M., & Friedman, E. M. (2009). Sleep duration in the United States: A cross-sectional population-based study. *American Journal of Epidemiology, 169*(9), 1052–1063.

Lee, S., & Kimble, L. P. (2009). Impaired sleep and well-being in mothers with low-birth-weight infants. *Journal of Obstetric, Gynecologic & Neonatal Nursing, 38*(6), 676–685.

Lin, K. Y., & Burgard, S. A. (2018). Working, parenting and work-home spillover: Gender differences in the work-home interface across the life course. *Advances in Life Course Research, 35*, 24–36.

Liu, H., & Debra, J. U. (2008). The times they are a changin': Marital status and health differentials from 1972 to 2003. *Journal of Health and Social Behavior, 49*(3), 239–253.

Liu, H., & Reczek, C. (2012). Cohabitation and U.S. adult mortality: An examination by gender and race. *Journal of Marriage and Family, 74*(4), 794–811.

Liu, H., Wang, Q., Keesler, V., & Barbara, S. (2011). Non-standard work schedules, work–family conflict and parental well-being: A comparison of married and cohabiting unions. *Social Science Research, 40*(2), 473–484.

Maume, D. J., & Ruppanner, L. (2017). Couple dynamics and sleep quality in international perspective. In S. M. McHale, V. King, & O. M. Buxton (Eds.), *Family contexts of sleep and health across the life course, national symposium on family issues*. Cham: Springer International Publishing.

Maume, D. J., Sebastian, R. A., & Bardo, A. R. (2009). Gender differences in sleep disruption among retail food workers. *American Sociological Review, 74*(6), 989–1007.

Maume, D. J., Sebastian, R. A., & Bardo, A. R. (2010). Gender, work-family responsibilities, and sleep. *Gender & Society, 24*(6), 746–768.

Maume, D. J., Hewitt, B., & Ruppanner, L. (2018). Gender equality and restless sleep among partnered Europeans. *Journal of Marriage and Family, 80*(4), 1040–1058.

McDonald, L., Wardle, J., Llewellyn, C. H., van Jaarsveld, C. H. M., & Fisher, A. (2014). Predictors of shorter sleep in early childhood. *Sleeping Medicine, 15*(5), 536–540.

Meadows, R., & Arber, S. (2012). Understanding sleep among couples: Gender and the social patterning of sleep maintenance among younger and older couples. *Longitudinal and Lifecourse Studies, 3*, 66–79.

Mikolai, J., Berrington, A., & Perelli-Harris, B. (2018). The role of education in the intersection of partnership transitions and motherhood in Europe and the United States. *Demographic Research, 39*, 753–794.

Musick, K., & Bumpass, L. (2012). Reexamining the case for marriage: Union formation and changes in well-being. *Journal of Marriage and Family, 74*(1), 1–18.
Musick, K., Meier, A., & Flood, S. (2016). How parents fare: Mothers' and fathers' subjective well-being in time with children. *American Sociological Review, 81*(5), 1069–1095.
Musick, K., Bea, M. D., & Gonalons-Pons, P. (2020). His and her earnings following parenthood in the United States, Germany, and the United Kingdom. *American Sociological Review, 85*(4), 639–674.
Office for National Statistics (2017). "*Births by Parents' Characteristics in England And Wales, 2016*"
Office for National Statistics (2019). "*Families and the labour market, UK: 2019*" .
Patel, S. R. (2007). Social and demographic factors related to sleep duration. *Sleep, 30*(9), 1077–1078.
Pepin, J. R., Sayer, L. C., & Casper, L. M. (2018). Marital status and mothers' time use: Childcare, housework, leisure, and sleep. *Demography, 55*(1), 107–133.
Perelli-Harris, B., & Blom, N. (2021). So happy together … Examining the association between relationship happiness, socio-economic status, and family transitions in the UK. *Population Studies*, 1–18.
Perelli-Harris, B., Hoherz, S., Lappegård, T., & Evans, A. (2019). Mind the "happiness" gap: The relationship between cohabitation, marriage, and subjective well-being in the United Kingdom, Australia, Germany, and Norway. *Demography, 56*(4), 1219–1246.
Perelli-Harris, B., Hoherz, S., Addo, F., Lappegård, T., Evans, A., Sassler, S., & Styrc, M. (2018). Do marriage and cohabitation provide benefits to health in mid-life? The role of childhood selection mechanisms and partnership characteristics across countries. *Population Research and Policy Review, 37*(5), 703–728.
Perelli-Harris, B., & Styrc, M. (2018). Mental well-being differences in cohabitation and marriage: The role of childhood selection. *Journal of Marriage and Family, 80*(1), 239–255.
Perelli-Harris, B., Berrington, A., Gassen, N. S.Á., Galezewska, P., & Holland, J. A. (2017). The rise in divorce and cohabitation: Is there a link? *Population and Development Review, 43*(2), 303–329.
Perelli-Harris, B., Sigle-Rushton, W., Kreyenfeld, M., Lappegård, T., Keizer, R., & Berghammer, C. (2010). The educational gradient of childbearing within cohabitation in Europe. *Population and Development Review, 36*(4), 775–801.
Petrov, M., & Lichstein, K. L. (2016). Differences in sleep between black and white adults: An update and future directions. *Sleeping Medicine, 18*, 74–81.
Raley, S., Bianchi, S. M., & Wang, W. (2012). When do fathers care? Mothers' economic contribution and fathers' involvement in child care. *American Journal of Sociology, 117*(5), 1422–1459.
Rapp, I., & Schneider, B. (2013). The impacts of marriage, cohabitation and dating relationships on weekly self-reported physical activity in Germany: A 19-year longitudinal study. *Social Science & Medicine, 98*, 197–203.
Richter, D., Michael, D. K., Tang, N. K. Y., Montgomery-Downs, H. E., & Lemola, S. (2019). Long-term effects of pregnancy and childbirth on sleep satisfaction and duration of first-time and experienced mothers and fathers. *Sleep, 42*(4). April 2019, zsz015.
Ruppanner, L., Maltby, B., Hewitt, B., & Maume, D. (2021). Parents' sleep across weekdays and weekends: The influence of work, housework, and childcare time. *Journal of Family Issues* (online version).
Sayer, L. C. (2016). Trends in women's and men's time use, 1965–2012: Back to the future?. In *Gender and couple relationships, national symposium on family issues* (pp. 43–77). Cham: Springer.
Schober, P., & Scott, J. (2012). Maternal employment and gender role attitudes: Dissonance among british men and women in the transition to parenthood. *Work, Employment and Society, 26*(3), 514–530.
Schor, J. (1991). *The overworked American: The unexpected decline of leisure*. Basic Books.
Stone, P.. 2007. *Opting out?: Why women really quit careers and head home*. University of California Press. https://www.ucpress.edu/book/9780520256576/opting-out.
Stone, P., & Lovejoy, M. (2019). Opting back. In *What really happens when mothers go back to work*. University of California Press.
Trask, B. S. (2013). Perspectives on women, work–family life, and global transformations. In B. S. Task (Ed.), *Women, work, and globalization: Challenges and opportunities*. New York: Routledge.
Umberson, D., Crosnoe, R., & Reczek, C. (2010). Social relationships and health behavior across life course. *Annual Review of Sociology, 36*, 139–157.
Umberson, D., Williams, K., Powers, D. A., Liu, H., & Belinda, N. (2006). You make me sick: Marital quality and health over the life course. *Journal of Health and Social Behavior, 47*(1), 1–16.
University of Essex, Institute for Social and Economic Research, NatCen Social Research, Kantar Public. 2019. Understanding Society: Waves 1–9, 2009–2018 and Harmonised BHPS: Waves 1–18, 1991–2009. [data collection]. 12th Edition. UK Data Service. SN: 6614.
Venn, S., Arber, S., Meadows, R., & Hislop, J. (2008). The fourth shift: Exploring the gendered nature of sleep disruption among couples with children. *The British Journal of Sociology, 59*(1), 79–97.
Walsemann, K. M., Jennifer, A. A., Fisk, C. E., & Brown, L. L. (2017). Do Gender and Racial/Ethnic Disparities in Sleep Duration Emerge in Early Adulthood? Evidence from a Longitudinal Study of U.S. Adults. *Sleeping Medicine, 36*, 133–140.
Yavorsky, J. E., Claire, M. K. D., & Schoppe-Sullivan, S. J. (2015). The production of inequality: The gender division of labor across the transition to parenthood. *Journal of Marriage and Family, 77*(3), 662–679.
Young, M., & Schieman, S. (2018). Scaling back and finding flexibility: Gender differences in parents' strategies to manage work–family conflict. *Journal of Marriage and Family, 80*(1), 99–118.
Zeitlin, J. A., Saurel-Cubizolles, M., & Ancel, P. (2002). Marital status, cohabitation, and the risk of preterm birth in Europe: Where births outside marriage are common and uncommon. *Paediatric and Perinatal Epidemiology, 16*(2), 124–130.