

# Timing of abortions, births, and union dissolutions in Finland

Dr Heini Väisänen

Department of Social Statistics and Demography  
University of Southampton  
Highfield  
Southampton SO17 1BJ  
United Kingdom

Email: [h.e.vaisanen@soton.ac.uk](mailto:h.e.vaisanen@soton.ac.uk)

Tel: +44 23 8059 3991

Fax: +44 23 8059 3131

Www: <https://heinivaisanen.com/>

Accepted for publication in *Demographic Research* on 8 Aug 2017.

## Abstract

### BACKGROUND

People make fertility decisions within the wider context of their lives. Previous studies have showed mutual factors influence relationship transitions and childbearing decisions. However, there is a lack of research on whether these factors also drive abortion decisions and decisions to end a romantic relationship; and whether their effect depends on being in a cohabitating or marital union.

### OBJECTIVE

To study whether the factors that influence relationship transitions and childbearing decisions are also associated with abortion decision-making.

### METHOD

I analysed nationally representative register data of Finnish women born in 1965–69 (N=17,666) using multi-level multi-process event-history models.

## RESULTS

Women's unobserved characteristics affected union dissolution, abortion, and childbearing decisions: women with a tendency towards unstable relationships were more likely to have an abortion, but less likely to give birth. The observed likelihood of abortion was lower for married than cohabiting women in the early years of the relationship, but became similar over time.

## CONCLUSIONS

Characteristics such as personality and religiosity may partly explain these results. In line with previous research on other union characteristics, also the likelihood of abortion in long-term cohabitations becomes similar to marriages over time.

## CONTRIBUTION

This study is the first to jointly estimate these three decision-making processes using reliable longitudinal data.

**Keywords:** induced abortion, fertility behaviour, union dissolution, Finland, register data, multi-process modelling

## 1. Introduction

The association between union instability and childbearing has been examined for instance in the United States (Lillard 1993; Lillard and Waite 1993), the United Kingdom (Aassve et al. 2006; Steele et al. 2005), and Brazil (Leone and Hinde 2007). These studies concluded that people make childbearing decisions together with decisions to continue or to leave a romantic relationship. In other words these decision-making processes are correlated and thus the processes should be modelled simultaneously to avoid bias in the estimates of the model (Steele et al. 2005). A shortcoming in previous studies is that due to underreporting of induced abortions (from now on: abortions) they were not able to take pregnancy terminations into

account although it would have provided more information about the dynamics of union dissolution and fertility behaviour (Berrington 2001; Leone and Hinde 2007; Steele et al. 2005). This is an important gap in the literature, as relationship problems are among the most common reasons women give for having an abortion (Bankole, Singh, and Haas 1998; Chibber et al. 2014; Finer et al. 2005; Kirkman et al. 2009). This implies there are factors that drive both processes: decisions to end or continue a romantic relationship and to have an abortion.

This study aims to fill in this gap in the literature by using longitudinal data from Finnish population registers to study whether there are mutual factors driving the decisions to terminate a pregnancy, to end a romantic relationship, and to have children. I interpret union dissolution to be an indicator of a period of difficulties in the relationship preceding it and am interested in whether such difficulties seem to have an association with abortion decisions. There might also be mutual factors that drive childbearing decisions and the other two processes. Abortions can be used to postpone, space or avoid births (Bankole, Singh, and Haas 1998), and childbearing may be less likely during the period preceding a union dissolution if the couple wants to avoid the high emotional and other costs of separation in presence of children (Lillard and Waite 1993).

The advantages of using register data include the lack of attrition over long follow-up times, full reporting of abortion, and knowing when each union started and ended. Finally, unlike in many other countries (Lyngstad and Skardhamar 2011), in Finland information on cohabitation has been included in the population registers since 1987, enabling studying whether the decision to terminate a pregnancy differs between those cohabiting and those married. To the best of my knowledge, this is the first study to analyse simultaneously the processes leading to abortions, births, and union dissolutions using reliable longitudinal data.

## **2. Background**

### **2.1 Births and union dissolutions**

The mutual factors driving childbearing and union dissolution decisions may differ depending on the culture around romantic relationships and childbearing. For instance, Lillard and Waite (1993) theorise that in the United States having children increases the costs of a break-up, and thus couples who suspect they will separate, do not wish to start childbearing, whereas those who are committed to their relationship are more likely to have children. In Brazil, women in consensual unions, which typically are less stable than marriages, may think childbearing decreases the chances of the union dissolving and thus want to have children with their current partner (Leone and Hinde 2007). In the United Kingdom, childbearing seems to stabilise relationships, but the effect was weaker for cohabiting than for married couples (Steele et al. 2005).

The level of commitment in a relationship may differ between marital and cohabiting unions in particular in the early stages of the relationship (Perelli-Harris 2014). Whether women see cohabitation as a good setting for childbearing depends on their personal characteristics and on the culture of the country they live in. A study in eight European countries shows that although cohabitation has become popular in Europe, the meaning of it varies by country (Perelli-Harris et al. 2014). For example, in Italy cohabitation was seen as low-level commitment, whereas in Norway few differences between cohabitation and marriage were found (Lappegård and Noack 2015; Perelli-Harris et al. 2014). A common finding among the countries, however, was that the first stages of cohabitation were seen as a minor step beyond dating (Perelli-Harris et al. 2014), even though long-term cohabiting unions often become like marriages in terms of level of commitment as the couple buys property, joins finances, and/or has children (Hoem, Jalovaara, and Muresan 2013; Holland 2011; Lyngstad, Noack, and Tufte 2011).

## 2.2 Abortions and union dissolutions

I expect decisions regarding pregnancy terminations and union transitions to a certain extent to be driven by mutual factors, because relationship problems are a commonly cited reason for an abortion (Bankole, Singh, and Haas 1998; Chibber et al. 2014; Finer et al. 2005; Kirkman et al. 2009). A woman may choose an abortion if she perceives her relationship to be too problematic, new or unstable; her partner is abusive; or she perceives him as not suitable or willing to be a father (Chibber et al. 2014; Kirkman et al. 2009). Almost four in ten women seeking abortions in the United States reported relationship problems as the reason for abortion. One in ten stated their concern was their relationship may dissolve soon, which could lead to lack of resources to take care of the child (Finer et al. 2005). Less than 40% of women in the United States who were in a romantic relationship when they sought to terminate a pregnancy were together with the same man two years later (Mauldon, Foster, and Roberts 2015). Although having to carry an unwanted pregnancy to term was associated with a short postponement of relationship dissolution compared to women who had an abortion, no difference among the proportion of women still in a relationship with the man involved was left approximately two years after conception (Mauldon, Foster, and Roberts 2015). Thus, abortions do not cause union dissolutions, but do often take place during a difficult period in a relationship.

The factors driving the decisions to have an abortion or leave a romantic partner may to some extent differ depending on whether a woman is cohabiting or married (Perelli-Harris et al. 2014). The likelihood of abortion may be higher in the early years of a cohabiting than a marital union but become similar over time, when cohabiting unions tend to become more similar to marriages in other terms as well (Hoem, Jalovaara, and Muresan 2013; Holland 2011; Lyngstad, Noack, and Tufte 2011).

### **2.3 Abortions and previous births**

The decision to continue or terminate a pregnancy also depends on timing of previous births and childbearing intentions. Abortions may be used to postpone, space, stop or avoid childbearing (Bankole, Singh, and Haas 1998). The costs of childbearing for young women may be large if they have not yet completed their education, formed stable partnerships, or had time to accumulate economic resources (Becker 1991; Hansen et al. 2009; Kreyenfeld 2010; Oppenheimer 1994; Väisänen and Murphy 2014). Some women report concern of the new child depriving existing children of parental and economic resources (Finer et al. 2005; Kirkman et al. 2009).

### **2.4 Other determinants of abortions, births, and union dissolutions**

Studies in Finland and other Nordic countries have shown socioeconomic characteristics, such as education, are associated with timing of births and family size (Kravdal 2001; Lappegård and Rønsen 2005; Nisén et al. 2013), the likelihood of abortion (Väisänen 2015, 2016), and union formation patterns (Jalovaara 2012). In the UK, employment transition, union transition, and childbearing decisions were intertwined (Aassve et al. 2006). Unfortunately employment and education transitions were not measured in enough detail in my data (see section 3.1 Data) to include these type of transitions here, but I controlled for socioeconomic characteristics in my models.

### **2.5 The Finnish context**

In Finland, there are no substantial limitations in obtaining abortions within the first trimester of the pregnancy. Abortion legislation changed in June 1970 allowing abortions due to social and economic reasons in addition to medical reasons, incest, and rape (FINLEX 2013). Since then, an early abortion (up to the end of 12 weeks of gestation) is typically always granted on social grounds on woman's application (Knudsen et al. 2003). Sexuality education has been

compulsory in schools since 1970 (Kontula 2010). All municipalities have been required to provide family planning services since 1972 (Kosunen 2000).

Abortions soon (up to 18 months) after births are relatively common in Finland, probably due to ineffective contraceptive use and attempting to use lactation as a method of pregnancy prevention among some women (Vikat, Kosunen, and Rimpelä 2002).

Policies reducing costs of childbearing, have been implemented in Finland since the late 1940s when the government started paying a universal child benefit (Forssén, Laukkanen, and Ritakallio 2003). In the mid-1970s parental leave was increased from three to seven months and further to nine months in 1981, during which the parent staying at home receives an allowance amounting to around 70% of his/her income prior to childbearing (KELA 2012). Since the mid-1980s a home care allowance has permitted a parent to stay at home without losing his or her job after the end of parental leave until their youngest child is three years old and get a benefit of approximately €300 per month (Haataja 2006; Vikat 2004). Universal right to day-care of children (under age three since 1985 and under age seven since 1996) in inexpensive and high-quality public nurseries is guaranteed by law (Haataja 2006; Vikat 2004). The high-quality education system, which is free of charge at all levels, further decreases the costs of childbearing.

In Finland, the proportion of births to unmarried women increased from 6% to 41% between 1970 and 2010 (Official Statistics of Finland 2012). The vast majority of these nonmarital births occurred within cohabiting unions (Hoem, Jalovaara, and Muresan 2013) indicating the attitudes towards cohabitation may be similar to those in Norway, where few differences between marital and cohabiting unions were found (see Lappegård and Noack 2015).

## 2.6 Aim of the study

My aim is to examine whether there are observed or unobserved factors, which drive the processes of having an abortion, timing of births, and union dissolutions using data of Finnish women born in 1965–1969. I estimate a model measuring the timing and outcome (birth or abortion) of pregnancies simultaneously with a model estimating the risk of union dissolution. If there are observed or unobserved factors that drive all these processes, these decisions are said to have been made jointly. If these decisions are made jointly due to characteristics not observed in this study, the unobserved components of the models for each process will be correlated (Steele et al. 2005). Thus, finding such correlations in this study would indicate that these processes should be modelled simultaneously. I also test whether the likelihood of terminating a pregnancy changes by length and type (marriage or cohabitation) of the relationship.

I did not include other types of union transitions, such as translating cohabitation into marriage, in my models because my focus is in understanding when women have abortions. Pregnancy terminations often take place while women are experiencing problems in their romantic relationships (Bankole, Singh, and Haas 1998; Finer et al. 2005), whereas pregnancies leading to childbirth are likely to be associated with, for instance, converting cohabitation into marriage (Steele et al. 2005). Almost 6% of conceptions leading to abortion in this study took place in the same year as union dissolution, compared to less than 2% of conceptions leading to births. Including other types of transitions would increase the complexity of the models greatly, making interpretation challenging and increasing greatly the time needed for the models to run (see also Steele et al. 2005).



### 3. Data and methods

#### 3.1 Data

Nationally representative data on women born in 1965–1969 was collected from the Register of Induced Abortions, the Medical Birth Register, and the Population Register of Finland. These women were followed up from the year they turn 15 until year 2010, when they were in their early to mid-40s. As information on cohabitation has been included in the Finnish population registers since 1987 but not before, these women were young enough to have (almost) all of their cohabitations recorded and old enough in 2010, when data collection ended, to have experienced a sufficient number of abortions, births, and union dissolutions to enable the analyses. I extracted this data from a dataset collected for a larger study project (Väisänen 2015; Väisänen and Murphy 2014). The sub-sample I used in this study forms a simple random sample of 19,166 women born in these years. I excluded those who were not born in Finland from the study in order to exclude those for whom complete union and pregnancy histories were not observed. There were 17,666 women in the final analytical sample. These women experienced 5,839 of abortions, 32,020 births, and 13,771 union dissolutions during the study period.

I defined anyone who was cohabiting or married as being ‘in union’ or ‘in relationship’ (used interchangeably). As I had no information of the partner’s identity, if a woman transitioned directly from cohabitation to marriage, I assumed this happened with the same partner. Similarly, I assumed any consistent period of cohabitation or marriage happened with the same partner. I defined union dissolution as transitioning from cohabitation to single, from married to cohabitation, or from married to divorced or widowed (there were only 122 widows in the sample and sensitivity analyses showed including or excluding them did not make much difference to the results, which are available on request). In my dataset, relationship status was

recorded on the last day of each year, and thus I assumed that the relationship status of each woman stayed constant throughout each calendar year. Consequently, if an abortion or a birth was recorded in the same year with union dissolution, I did not know which happened first. Not knowing when exactly these events took place is a shortcoming of these data and should be kept in mind when interpreting the results of the study.

The month and year of all live births and abortions were recorded, but data on stillbirths or miscarriages was not available. I calculated the age of the youngest child based on time since last live birth and parity of each woman based on the number of live births. Using this information, I created a variable measuring the number and age of children including five categories: no children, one child aged less than 18 months, one child aged 18 months or more, two or more children of whom youngest is aged less than 18 months, and two or more children of whom youngest is aged 18 months or more. Preliminary analyses showed that using this variable rather than two separate variables measuring the number and age of the children eased model convergence. I chose the age of 18 months as the cut-off point, as it has been shown that in Finland the risk of abortion is high up to 18 months after birth (Vikat, Kosunen, and Rimpelä 2002).

Education was measured at ages 20, 25, and 30 (or the nearest year possible, see e.g. Väisänen 2016) and classified into two categories: 'low' versus 'middle or high', where low means having completed lower secondary education (10 years of school), middle having completed upper-secondary education (further three years), and high having completed at least undergraduate-level education.

### **3.2 Methods**

As each woman may experience more than one union, birth, and abortion, these events are nested within individuals. The duration between these events is typically correlated within each

individual, because there may be characteristics jointly impacting a woman's likelihood to experience these events. This hierarchical structure is best handled using a multi-level model, which takes into account any unobserved time-invariant woman-level characteristics affecting the likelihood of the outcome of interest by adding a woman-specific random effect to the model (Steele et al. 2005; Steele, Goldstein, and Browne 2004).

If pregnancy decisions are made jointly with union dissolution decisions, the indicators of pregnancy outcomes will not be independent from the residuals of the union dissolution model, which leads to a risk of biased parameter estimates if the events are modelled separately (Steele et al. 2005). Thus, I estimated three equations simultaneously—one for each outcome of interest (conception leading to abortion, conception leading to birth, and union dissolution)—allowing the woman-level random effects specified in the respective multi-level models to correlate freely across equations. Finding such correlation would imply pregnancy decision-making is endogenous with respect to union dissolutions (Steele et al. 2005).

The three equations were all discrete-time event-history models. Multi-level multi-process modelling of continuous-time event-history models was first outlined by Lillard (1993), but others have applied these models to discrete-time event-history models since (Steele et al. 2005; Steele, Goldstein, and Browne 2004).

I assumed all correlation in the random parts of the models was taken into account by allowing the woman-level random effects to correlate across equations. Thus, I assumed these unmeasured characteristics remained constant throughout the study period. This is a limitation in the model, as it does not allow for selection on time-varying unobserved characteristics. However, it is only an issue, if there is a change in the relevant unobserved characteristics due to an unobserved event. If there is a change in (one of) the time-varying observed characteristics, the model controls for these changes (such as pregnancy intentions changing

after a birth of a child) (Steele et al. 2005). I conducted the analyses using Bayesian estimation (Markov chain Monte Carlo (MCMC))<sup>1</sup> (see e.g. Browne 2009; Leckie and Charlton 2013) in MLwiN (Rasbash et al. 2009) through the *runmlwin* command in Stata 14 (Leckie and Charlton 2013).

### 3.3 Analytic strategy

I measured the duration of time in birth and abortion models as years since age 15 until the estimated time at first conception and as years since the end of each pregnancy after that. If a woman had no pregnancies, the duration was measured until year 2010. As the length of gestation was not recorded in my dataset, I assumed the time of conception was three months before an abortion and nine months before a birth. As timing of abortions and births were measured at monthly intervals, I divided the duration under risk of an event (conception) during each one year interval by the number of months the woman was at risk during that year to prevent loss of information compared to having used monthly intervals. The duration variable in the union dissolution analyses was years spent in each union.

I included all pregnancies in the models for pregnancy outcomes, as it is likely that previous birth and abortion experiences affect future pregnancy decisions regardless of whether they took place within a union. These models also include women who have never been pregnant.

---

<sup>1</sup> I initially explored the models using the first order marginal quasi-likelihood method and used these results as starting values for Bayesian estimation using MCMC models (see e.g. Browne 2009; Leckie and Charlton 2013). I used 10,000 iterations in the burn-in period to stabilize the chains before starting the actual iteration process of 100,000 rounds. I ran the models with orthogonal fixed effect vectors and parameter expansion to reduce the number of iterations needed to achieve sufficient effective sample size (ESS), that is, an estimate of the number of independent samples on which summary statistics for each parameter are based (Browne 2015; Browne et al. 2009; Leckie and Charlton 2013). I used diagnostic tools to ensure the chains had converged (available on request).

The union dissolution model only includes the episodes women spent in relationships. Therefore, it only includes women who ever entered a relationship. When interpreting the results of all three processes jointly, I focus on episodes, when women were either married or cohabiting even though the pregnancy equation still includes also the episodes women spent without a partner.

### 3.3.1 The hazard of pregnancy outcomes

As a conception can lead to an abortion or to a birth, the hazard of pregnancy outcomes is best examined using a competing risks model. The competing risks model for pregnancy outcomes consists of two logistic regression models with correlated random effects.

I chose which variables to include in the model based on preliminary analyses. Time-varying covariates indicating whether a woman was single, cohabiting or married in each point in time were included in the models and interacted with relevant variables. I also included time-varying indicators of divorce or dissolution of cohabiting union as explanatory variables to see whether a union dissolution is associated with the hazard of abortion differently in cohabiting and marital unions. The model equation is as follows (omitting the subscripts for women and episodes):

$$\begin{aligned} \text{logit}(h_t^{ab}) = & \beta_0^{ab} + \beta_1^{ab} D_t^{ab} + \beta_2^{ab} A_t^{ab} + \beta_3^{ab} L_t^{ab} + \beta_4^{ab} T_t^{ab} + \beta_5^{ab} L_t^{ab} \\ & \times T_t^{ab} + \beta_6^{ab} C_t^{ab} + \beta_7^{ab} PA_t^{ab} + \beta_8^{ab} UD_t^{ab} + \beta_9^{ab} X_t^{ab} + u^{ab} \end{aligned} \quad (1)$$

Where  $h_t^{ab}$  is the hazard of abortion within time interval  $t$ , in episode  $i$  for individual  $j$ ;  $D_t^{ab}$  is length of time in years since age 15 or for second and higher order pregnancies since the end of last pregnancy;  $A_t^{ab}$  is the woman's age (centered around the grand mean);  $L_t^{ab}$  is the length of the current union in years;  $T_t^{ab}$  is type of relationship status (single, married or cohabiting);  $L_t^{ab} \times T_t^{ab}$  is an interaction term between the two;  $C_t^{ab}$  is a time-varying categorical variable

indicating the number and age of existing children (reference group being childless women);  $PA_t^{ab}$  is a time-varying indicator of the woman having had a previous abortion;  $UD_t^{ab}$  is a time-varying indicator telling whether a union dissolution took place within the year of interest and whether it was a divorce or dissolution of a cohabiting union;  $\mathbf{X}_t^{ab}$  represents a vector of exogenous covariates; and  $u^{ab}$  is the woman-level random effect, assumed to be normally distributed:  $u^{ab} \sim N(0, \sigma_{ab}^2)$ . I specified the duration since last pregnancy and length of the current union as quadratic functions and woman's age as a linear function. Preliminary analyses confirmed the quadratic function as the most appropriate formulation (results available on request). All variables included in the model vary in time.

The model for the hazard of birth  $h_t^b$  consists of the same elements as that of abortion. Its woman-level random effect,  $u^b$ , assumed to be normally distributed:  $u^b \sim N(0, \sigma_b^2)$  and allowed to be correlated with  $u^{ab}$ .

### 3.3.2 The hazard of union dissolution

I estimated the hazard of union dissolution first in a single-process multi-level model, then simultaneously with the competing risks model of pregnancy outcomes. I combined cohabitations and marriages into one 'union' state and included a time-varying indicator of whether a woman's current union was a cohabitation or a marriage. I interacted it with relevant variables allowing the results to differ depending on the type of union the women were in. The equation for the union dissolution model is as follows (omitting the subscripts for women and episodes):

$$\begin{aligned} \text{logit}(h_t^d) = & \alpha_0 + \alpha_1 L_t^d + \alpha_2 T_t^d + \alpha_3 L_t^d \times T_t^d + \alpha_9 AU_t^d + \alpha_{10} C_t^d + \alpha_{11} P_t^d \\ & + \alpha_{12} PA_t^d + \alpha_{13} \mathbf{X}_t^d + u^d \end{aligned} \quad (2)$$

Where  $h_t^d$  is the hazard of union dissolution within time interval  $t$ , in union  $i$  for individual  $j$ ;  $L_t^d$  is the length of the current union in years;  $T_t^d$  is type of union (marriage or cohabitation);

$L_t^d \times T_t^d$  an interaction between the two;  $AU_t^d$  is the woman's age at the start of the union;  $C_t^d$  is a categorical variable indicating the number and age of existing children (reference group being childless women);  $PA_t^d$  is an indicator of the woman having ever had an abortion;  $X_t^d$  represents a vector of exogenous covariates; and  $u^d$  is the woman-level random effect, assumed to be normally distributed:  $u^d \sim N(0, \sigma_d^2)$ , and allowed to be correlated with  $u^{ab}$  and  $u^b$  in the three-process model. I specified the length of current union as a quadratic function based on preliminary analyses (results available on request). All variables included in the model vary in time.

### 3.3.3 The three-process model of all outcomes

In the results section I first show the results of the single-process model for union dissolution and the competing risks model for pregnancy outcomes. Secondly, I present the results of a joint three-process model of all outcomes. I highlight some results of the fixed part of the model (i.e. the observed variables) using population median predictions, that is, the average of predicted probabilities of experiencing the outcome of interest calculated for each individual while fixing the random effect of the equation of interest to its mean of zero.

## 4. Results

### 4.1 Descriptive statistics

Table 1 shows the distribution of the variables used in this study. Women were on average younger at the time of abortion (26 years) than at the time of birth (29.5 years). The average length of a union at the time of abortion was longer (6.3 years) than at the time of birth (5.6 years). In a half of the unions which were converged from cohabitation to marriage, the marriage took place during the second year of cohabitation (not shown). Women had on average 1.8 children at the end of the study period, but less than one at the time of a birth or an abortion. Among parous women, time since last birth was on average 1.3 years at the time of

an abortion, but almost three years at the time of birth. Women entered their first union around the age of 24 and their second one in their early thirties (Table 1).

**Table 1: Distribution of variables in the sample and at the time of abortions and births (N=17,666)**

	Mean (std.dev.)		
	Sample mean	At the time of abortion	At the time of birth
<i>Age</i>	28.9 (0.01)	25.8 (0.09)	29.5 (0.03)
<i>Years in union</i>	6.9 (0.05)	6.3 (0.12)	5.6 (0.02)
<i>Number of children<sup>a</sup></i>	1.80 (0.01)	0.80 (0.02)	0.94 (0.01)
<i>Age of the youngest child (parous women)<sup>a</sup></i>	11.2 (0.04)	1.3 (0.05)	2.8 (0.02)
<i>Age at the start of the 1st union</i>	23.7 (0.03)		
<i>Age at the start of the 2nd union</i>	30.7 (0.07)		
	% at the end of the study	% at the time of abortion	% at the time of birth
<i>Ever had an abortion<sup>a</sup></i>	23.2		
<i>Low education</i>	14.3	45.8	16.9
<i>Middle education<sup>b</sup></i>	70.5	51.2	70.7
<i>High education<sup>b</sup></i>	15.2	3.0	12.4
<i>In union<sup>a</sup></i>	71.0	37.2	92.3

Notes: (a) Measured at the end of the study period; (b) In the multivariate models these categories were combined into one category of 'at least middle education'. Data source: Register of Induced Abortions, Medical Birth Register and the Population Register of Finland.

Table 1 shows that 23% of the women ever had an abortion. Almost half of these women only had low education at the time of abortion, although at the end of the study period only 14% remained in this category. This is because many women obtained abortions when they were relatively young, and they only completed their education after the event. Around 37% of women were in union at the time of abortion, compared to 90% of births.

Table 2 provides information on sequencing of the partnership events and pregnancies. Around 9% of women remained single throughout the study period, whereas around a fifth cohabited but never married, and 16% married but never cohabited. Around 30% had more than one cohabiting union but only 3% more than one marriage. A fifth of unions were direct marriages (or marriages which were preceded by cohabitation that started the same year the couple got married in which case only marriage would show up in registers), and the rest were cohabiting



unions or unions that started with cohabitation and were later converged into marriage. Almost a half of the women experienced at least one union dissolution.

**Table 2: Sequencing of partnership events and pregnancy outcomes, % and N**

<b>Partnership history</b>	<b>%</b>	<b>N (women)</b>
<i>Never in union (% of women)</i>	8.6	1,526
<i>Cohabitation only (% of women)</i>	21.0	3,703
<i>Marriage only (% of women)</i>	16.4	2,888
<i>Several cohabiting unions (% of women)</i>	29.9	5,257
<i>Several marriages (% of women)</i>	2.6	451
<i>Direct marriage (% of unions) <sup>a</sup></i>	20.8	5,256 <sup>a</sup>
<i>Ever union dissolution (% of women)</i>	48.1	8,407
<b>Pregnancy history (% out of ever pregnant women)</b>		<b>N (events)</b>
<i>Births only</i>	71.7	10,345
<i>Abortion(s) then birth(s)</i>	12.2	1,764
<i>Birth(s) then abortion(s)</i>	5.1	729
<i>Abortions only</i>	4.7	675
<i>Birth(s), abortion(s), birth(s)</i>	2.8	408
<i>Abortion(s), birth(s), abortion(s)</i>	1.7	250
<i>More complex sequences</i>	1.8	258
<b>Ever pregnant (% out of all women)</b>	<b>81.2</b>	<b>14,369</b>

Notes: (a) Or unions which became marriages the same year cohabitation started; N of unions. Data source: Register of Induced Abortions, Medical Birth Register and the Population Register of Finland.

Table 2 also shows that most women in the sample who ever got pregnant (N=14,549, 81% of women), only experienced pregnancies ending in birth (72% of ever pregnant women). Approximately 5% of them only experienced abortion(s). Around 12% postponed childbearing by terminating their first pregnancy (or first pregnancies), but later had birth(s), and 5% first had birth(s) which were followed by abortion(s). The rest of the women experienced more complex pregnancy histories.

#### 4.2 Unobserved characteristics

In all the conducted multi-level models, the woman-specific error variances were statistically significantly different from zero, indicating there were time-invariant woman-level unobserved characteristics affecting women's likelihood of terminating a pregnancy, giving birth, or leaving a romantic relationship (Table 3). These random effects were correlated with each other

in the multi-process models, showing that abortion decisions were made jointly with childbearing and relationship decisions. The correlations were significant, as indicated by the credible intervals not including zero as well as the Bayesian deviance information criterion (DIC) values, which were smaller for the model where correlations between the three random effects were allowed for (DIC=344,454, not shown) than for the model where the correlations were restricted to zero (DIC=344,768, not shown).

**Table 3: The variances of the random effects and their correlations across equations (95% credible intervals (CI) in parentheses)**

<b>a. Single-process (for union dissolution) and competing risks (for pregnancy outcomes) models</b>			
<b>OUTCOME</b>	<i>Union dissolution</i>	<i>Abortion</i>	<i>Birth</i>
<i>Union dissolution</i>	0.45 (0.38, 0.51)		
<i>Abortion</i>		0.48 (0.37, 0.59)	
<i>Birth</i>		-0.32 (-0.51, -0.15)	0.14 (0.12, 0.17)
<b>b. Three-process model</b>			
<b>OUTCOME</b>	<i>Union dissolution</i>	<i>Abortion</i>	<i>Birth</i>
<i>Union dissolution</i>	0.47 (0.41, 0.54)		
<i>Abortion</i>	0.60 (0.47, 0.72)	0.55 (0.43, 0.67)	
<i>Birth</i>	-0.29 (-0.42, -0.17)	-0.28 (-0.45, -0.12)	0.14 (0.11, 0.17)

Notes: Diagonals show the variance (95% CI) of the random effect and off-diagonals the respective correlations between the random effects (95% CI). Data source: Register of Induced Abortions, Medical Birth Register and the Population Register of Finland.

The correlation between the random effect of the abortion model and that of the birth model was moderately strong and negative in the competing-risks and the three-process models (-0.32 and -0.28, respectively) (Table 3). It suggests women with above-average risk of an abortion had a below-average risk of giving birth due to time-invariant unobserved characteristics.

The correlation between the random effects of the abortion and the union dissolution models was strong and positive (0.61), suggesting women with an above-average risk of a union dissolution due to unobserved characteristics also had an above-average risk of an abortion (Table 3). In other words, women who had unstable unions also had a higher likelihood of abortion due to unobserved woman-specific characteristics affecting both the probability of her union dissolving and her likelihood of terminating a pregnancy.

The correlation between the random effects in the birth and union dissolution models was negative ( $-0.29$ ), which implies women with high propensity of union dissolution due to time-invariant unobserved characteristics had below average propensity to give birth (Table 3).

#### **4.3 Observed characteristics and the hazard of abortion**

The fixed parts of the competing risks and the three process models were similar (Table 4). Thus, the results I report below refer to the three-process model, but in most cases also hold for the single-process and competing risks models. As expected, the estimates changed the most for covariates measuring aspects similar to those in the added third process; that is variables measuring births, abortions, and relationship events.

Figure 1 shows the population median predicted probabilities of abortion by union length and type based on the three-process model. Married women had a low likelihood of abortion throughout their union. Women in cohabiting relationships had a higher probability of abortion at the beginning of the union than married women, but it declined over time, reaching the levels of married women after around five years of cohabitation. Tendency of cohabiting unions to become more like marriages over time has also been found in other studies (Hoem, Jalovaara, and Muresan 2013; Holland 2011; Lyngstad, Noack, and Tufte 2011; Perelli-Harris et al. 2014).

Those who experienced a divorce had three times higher odds than those who did not to experience a conception leading to abortion within the same year. Among women who experienced a dissolution of cohabiting union, the odds were 88% higher than among those who experienced no dissolution (Table 4).

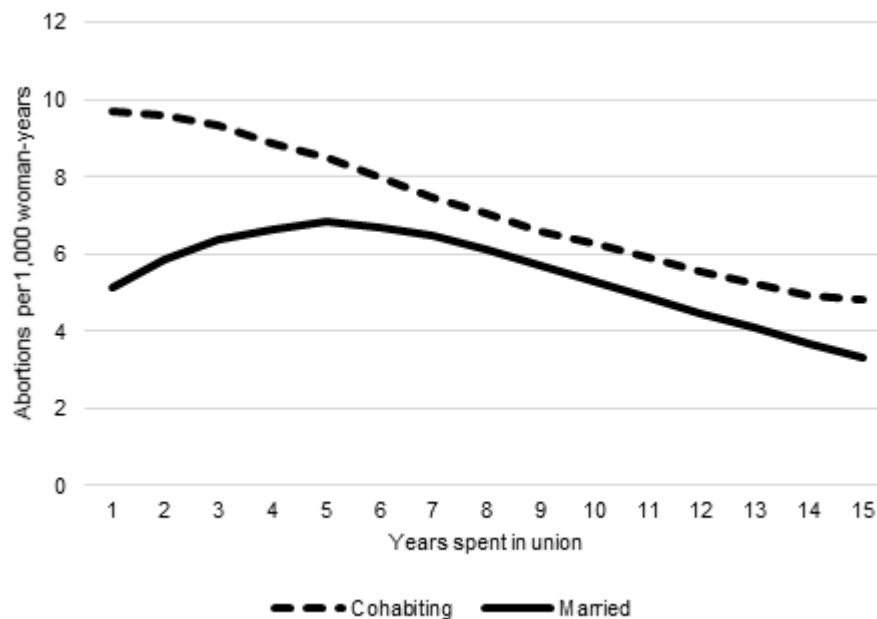
**Table 4: Odds ratios of MCMC models (single-process/competing risks and three process models) estimating the hazards of (a) conception leading to abortion; (b) conception leading to birth; and (c) union dissolution.**

	<i>a. Outcome: abortion.</i>		<i>b. Outcome: birth.</i>		<i>c. Outcome: union dissolution</i>	
	Competing risks OR	Three-process OR	Competing risks OR	Three-process OR	Single-process OR	Three-process OR
CONSTANT	0.01***	0.01***	0.01***	0.01***	0.01***	0.01***
UNION STATUS (ref.= Not in union)						
<i>Married</i>	0.43***	0.41***	23.5***	23.8***	1.00 (ref.)	1.00 (ref.)
<i>Cohabiting</i>	0.85**	0.86**	6.04***	6.02***	7.58 <sup>a</sup> ***	7.57 <sup>a</sup> ***
PREGNANCY INTERVAL						
<i>Years since age 15 or last pregnancy</i>	1.09***	1.09***	1.07***	1.07***	n/a	n/a
<i>Years since age 15 or last pregnancy</i> <sup>2</sup>	0.99***	0.99***	0.997***	0.997***	n/a	n/a
LENGTH OF UNION						
<i>Years in union</i>	1.02	1.05*	0.95***	0.94***	1.11***	1.10***
<i>Years in union</i> <sup>2</sup>	0.997***	0.997***	0.997***	0.997***	0.996***	0.997***
<i>Years in union</i> * <i>Cohabiting</i>	0.89***	0.90***	1.15***	1.14***	0.99	1.00
<i>Years in union</i> <sup>2</sup> * <i>Cohabiting</i>	1.01***	1.01***	0.995***	0.995***	0.998**	0.998***
NUMBER AND AGE OF CHILDREN (Ref.=Childless)						
<i>One child aged &lt; 18 months</i>	2.98***	2.84***	3.26***	3.29***	0.51***	0.54***
<i>One child aged ≥ 18 months</i>	1.53***	1.45***	0.95	0.97	1.11**	1.14***
<i>Two or more children, youngest &lt; 18 months</i>	3.76***	3.39***	0.62***	0.63***	0.39***	0.44***
<i>Two or more children, youngest ≥ 18 months</i>	1.57***	1.41***	0.29***	0.30***	0.85***	0.90
EVER HAD AN ABORTION	1.43***	1.36***	1.21***	1.20***	1.37***	1.03
UNION DISSOLUTION (ref. no dissolution)						
<i>Divorce</i>	3.99***	3.31***	0.16***	0.17***	n/a	n/a
<i>Dissolution of cohabiting union</i>	2.33***	1.88***	0.53***	0.56***	n/a	n/a
LOW EDUCATION (Ref.= Mid/high)	1.41***	1.40***	0.90***	0.90***	1.36***	1.36***
AGE	0.96***	0.95***	0.98***	0.98***	0.95 <sup>b</sup> ***	0.95 <sup>b</sup> ***
TWO OR MORE UNIONS (Ref.= One)	n/a	n/a	n/a	n/a	2.01***	1.97***

Notes: (a) ref: married; (b) age at the start of the union; n/a= not applicable; Ref.= Reference category; \*\*\*p<0.001; \*\*p<0.01; \*p<0.05; All variables are time-varying.

Source: Register of Induced Abortions, Medical Birth Register and the Population Register of Finland.

**Figure 1: Predicted population median estimates of number of abortions per 1000 woman-years among married and cohabiting couples by union length in years.**



*Note:* Probabilities calculated based on the three-process model presented in Table 4.

*Source:* Register of Induced Abortions, Medical Birth Register, and the Population Register of Finland.

Women with their youngest child aged less than 18 months had around three times higher odds of abortion than women with no children (Table 4). Their odds also were higher than among women with older children. Although the odds were quite different depending on the age of the youngest child, the risk did not vary as much depending on whether the woman only had one child or at least two children. The high risk of abortion among mothers with young children is consistent with the earlier findings showing abortions are relatively common soon after birth in Finland (Vikat, Kosunen, and Rimpelä 2002).

Having had a previous abortion increased the odds of having another one by around 36%. As suggested by previous studies (e.g. Regushevskaya et al. 2009; Väisänen 2015, 2016), low education was associated with a higher likelihood of abortion. The odds of abortion were negatively associated with age (Table 4).

#### **4.4 Observed characteristics and the hazard of birth**

Married women had more than 20 times the odds of experiencing a conception leading to live birth than single women, whereas cohabiting women were in between the two groups with six times the odds of single women (Table 4). A divorce was associated with lower odds ( $OR=0.17$  compared to those who experienced no dissolution) of experiencing a conception leading to birth within the same year than among women who experienced a dissolution of cohabiting union ( $OR=0.56$ ).

Mothers of one child under the age of 18 months had higher odds of experiencing a conception leading to birth than those whose children were older, those with at least two children, and those with no children. This perhaps reflects a desire to have one's children relatively closely spaced but to stop childbearing after having had two children. Having had an abortion in the past was associated with 20% higher odds of conceiving and subsequently giving birth than among those who had never had an abortion. The association between low education and the likelihood of birth was negative (Table 4).

#### **4.5 Observed characteristics and the hazard of union dissolution**

Interestingly, having had an abortion in the past increased the risk of union dissolution in the single-process model, but the association was no longer significant when the relevant processes were modelled simultaneously (Table 4). This implies the association observed in the single-process model was due to women with higher propensity to have an abortion due to unobserved characteristics also being more likely to experience a union dissolution due to these characteristics rather than due to having had a previous abortion. The odds of union dissolution were higher among cohabiting than married couples. Women with young children were less likely to separate from their partners than women with children who were at least 18 months old and women who had no children. The highest odds of union dissolution were observed

among those who had one child older than 18 months. Higher education was associated with lower risk of union dissolution.

## **5. Discussion**

### **5.1 Summary of findings**

I examined whether there were unobserved mutual factors driving the decision-making processes regarding abortions, births, and union dissolutions by estimating these three processes simultaneously and testing whether the unobserved (random) parts of these models were correlated. All the random effects correlations were statistically significant, confirming there were mutual unobserved factors driving these processes. Ignoring such correlation and estimating the models separately may lead to bias in the estimates of the observed part of the model (Lillard 1993; Steele et al. 2005). Estimating the three processes simultaneously also shows how they were intertwined and helps understanding the possible mechanisms behind these findings. This is the first study to examine this issue.

There were unobserved time-invariant woman-level characteristics, which were associated with the likelihood of experiencing an abortion, a birth, and a union dissolution. The characteristics explaining, for instance, the unobserved heterogeneity in the likelihood of abortion may include such things as personality traits, which have been shown to be associated with the planning status of pregnancies (Berg et al. 2013); negative attitudes towards abortion, as those may lead to not terminating a pregnancy even if it was unwanted (Johnson-Hanks et al. 2011); religiosity, which has been associated with negative attitude towards abortion in the United States (Ellison, Echevarría, and Smith 2005; Hess and Rueb 2005); and preferred family size, as women with a high preferred family size may be less likely to terminate an unintended pregnancy than women who want to restrict their family size at lower levels, although this only applies if the preference remains unchanged over time. Longitudinal studies in the United

States showed most women's fertility preferences stay constant over several years (Heaton, Jacobson, and Holland 1999; White and McQuillan 2006).

## **5.2 Abortions and union dissolutions**

Women more inclined to have unstable relationships were also more likely to have an abortion due to characteristics which were unobserved in this study. It may be that religious women, who are more likely to express negative attitudes towards abortion (Ellison, Echevarría, and Smith 2005; Hess and Rueb 2005) are also less likely to approve of divorce, making them less likely to experience either of these events. Perhaps the personality traits associated with the planning status of pregnancies (Berg et al. 2013) can also be associated with the likelihood of union dissolution.

The fixed part of the models showed likelihood of abortion was higher among women who experienced a union dissolution than among those who did not. Interestingly, the effect was stronger for divorce than it was for dissolution of a cohabiting union. If union dissolution is an indicator of problems in the relationship in the period preceding the dissolution, the finding is consistent with previous studies, which have shown that having relationship problems is a commonly cited reason for requesting an abortion (Bankole, Singh, and Haas 1998; Chibber et al. 2014; Finer et al. 2005; Kirkman et al. 2009). Women in relationships that are likely to dissolve soon, may be less likely to want children due to the added cost of breaking up if children are involved (Lillard and Waite 1993) and thus are more likely to terminate an unintended pregnancy than those in a stable relationship.

The likelihood of abortion was higher for women who were cohabiting than for women who were married during approximately the first five years of the union. Perhaps some abortions within cohabiting unions were obtained because the women felt the pregnancy happened too early in the relationship (Chibber et al. 2014; Kirkman et al. 2009), whereas it may be less



likely for married women to think the relationship is not yet ready for childbearing. After the first five years, the risks were at similar levels among both groups. This is in line with studies showing cohabitations tend to become similar to marriages over time despite the differences in the early stages of the unions (Hoem, Jalovaara, and Muresan 2013; Holland 2011; Lyngstad, Noack, and Tufte 2011; Perelli-Harris et al. 2014).

### **5.3 Abortions and births**

The correlation between the random effects in the competing risks model measuring the hazard of births and abortions was moderate and negative. This implies that due to unobserved time-invariant characteristics, women who had an above-average risk of giving birth, had a below-average risk of abortion. Such characteristics may include, for example, religious beliefs which are often associated with negative attitudes towards abortion (Ellison, Echevarría, and Smith 2005; Hess and Rueb 2005) and preference for high fertility (Frejka and Westoff 2007; McQuillan 2004).

### **5.4 Births and union dissolutions**

The random effects correlation between the union dissolution and birth models was negative. A positive correlation, which has been found previously (e.g. Leone and Hinde 2007) would have implied women, who due to time-invariant unobserved characteristics were more likely to experience union dissolutions, also were more likely to have above-average fertility. This may happen if couples in each new partnership wish to have a child together in order to show commitment to each other, or to stabilise otherwise precarious relationship, resulting in a higher fertility compared to those with fewer partnerships (Balbo, Billari, and Mills 2013; Leone and Hinde 2007). Evidence of such mechanisms were not found here. It may be because marrying more than once was rare in this dataset, and women who had more than one union most often first cohabited, which was followed by cohabitation and/or marriage with a new partner.

Perhaps the first union most women experienced happened early in the life course (average age 23.7) and was not as committed of a relationship as later unions may be.

### **5.5 Limitations of the study**

There were limitations in this study. The reasons for abortion are complex and there is rarely only one reason contributing to the decision (Bankole, Singh, and Haas 1998; Kirkman et al. 2009). I focused on two aspects: romantic relationships and timing of births, but I did not separately address other aspects women commonly cite when having an abortion, such as economic concerns (Bankole, Singh, and Haas 1998; Finer et al. 2005). Estimating education and career trajectories simultaneously with pregnancy and relationship transitions was not possible due to lack of appropriate data on education and career transitions—it would have been necessary to know, for example, when exactly women completed their education and transitioned into employment. Future studies should address this issue.

I cannot claim there is a causal relationship based on the results of this study, as the timing of the events was not clear. If a pregnancy and a union dissolution were registered to have happened during the same year, it was impossible to know which happened first, as the exact timing of the union dissolution was not recorded. However, the timing of the decision-making processes would remain unclear even if I had known the exact date of union dissolution; it takes time before a divorce comes into force, and moving out from a mutual home may take months. Thus, with register data the timing of these types of events is always imprecise. However, the advantages of register data in a study of abortion due to superior data reliability are big enough to justify using register data.

While the discussion of possible mutual factors driving the three processes in this study was restricted to description of time-invariant woman-level characteristics, which may drive the three processes, it may be that the random effects of these processes were correlated also due

to other reasons. It is likely, for instance, that women consider the implications of one decision (e.g. to leave a romantic relationship) on other decisions (e.g. whether to continue a pregnancy). In order to test this assumption statistically, it would be necessary to fit a full structural model, which allows for the structural effects of the hazard of one outcome to affect the other (see e.g. Lillard and Waite 1993). Fitting such a model requires using instrumental variables, which are associated with one outcome, but not the other(s). Lillard and Waite (1993) achieved this by exploiting the differences in US state-level policies and characteristics, but such differences do not exist in Finland. Future studies using data with suitable instrumental variables included should address this issue.

## 5.6 Conclusions

There were time-invariant unobserved woman-level characteristics, which jointly affected the likelihood of experiencing an abortion, a birth or a union dissolution. Such characteristics may include for instance personality, attitudes, and beliefs (Berg et al. 2013; Ellison, Echevarría, and Smith 2005; Hess and Rueb 2005; Johnson-Hanks et al. 2011). The likelihood of obtaining an abortion was higher for cohabiting than married women during the first five years of the union after which few differences were observed between the two groups. While experiencing a union dissolution was associated with a higher risk of abortion within the same year, the effect was stronger for divorce than for dissolution of a cohabiting union. These results are in line with studies showing that while cohabiting relationships may be less committed than marriages in the early stage of the union, cohabitations tend to become similar to marriages over time (Hoem, Jalovaara, and Muresan 2013; Holland 2011; Lyngstad, Noack, and Tufte 2011; Perelli-Harris et al. 2014).

The strengths of this study include the reliability of the dataset, which does not suffer from underreporting of abortion or attrition over time. Moreover, this is the first time the decision-

making processes regarding abortions, births, and union dissolutions have been estimated and studied jointly, thus making an important contribution.

## **6. Acknowledgements**

Many thanks to Professor Fiona Steele, Dr Tiziana Leone, and Professor Mike Murphy for their helpful comments on the manuscript, and Professor Mika Gissler and Dr Markus Jokela for their expertise help in obtaining the data set. The author would like to thank feedback from the participants of in the European Society for Health and Medical Sociology conference in Geneva in June 2016, where an earlier version of this paper received the best paper prize. The author was supported by the Economic and Social Research Council [grant number ES/J00070/1]. The author is grateful to Statistics Finland and the National Institute of Health and Welfare for their permissions (TK53-162-11 and THL/173/5.05.00/2011, respectively) to use these data.

## References

- Aassve, A., Burgess, S., Propper, C., and Dickson, M. (2006). Employment, Family Union and Childbearing Decisions in Great Britain. *Journal of the Royal Statistical Society. Series A (Statistics in Society)* 169(4):781–804.
- Balbo, N., Billari, F.C., and Mills, M. (2013). Fertility in Advanced Societies: A Review of Research. *European Journal of Population / Revue européenne de Démographie* 29(1):1–38. doi:10.1007/s10680-012-9277-y.
- Bankole, A., Singh, S., and Haas, T. (1998). Reasons Why Women Have Induced Abortions: Evidence from 27 Countries. *International Family Planning Perspectives* 24(3):117–152. doi:10.2307/3038208.
- Becker, G.S. (1991). *A Treatise on the Family*. Enlarged ed. Cambridge, Mass, London: Harvard University Press.
- Berg, V., Rotkirch, A., Väisänen, H., and Jokela, M. (2013). Personality is differentially associated with planned and non-planned pregnancies. *Journal of Research in Personality* 47(4):296–305. doi:10.1016/j.jrp.2013.01.010.
- Berrington, A. (2001). Entry Into Parenthood and the Outcome of Cohabiting Partnerships in Britain. *Journal of Marriage and Family* 63(1):80–96. doi:10.1111/j.1741-3737.2001.00080.x.
- Browne, W.J. (2009). *MCMC Estimation in MLwiN v2.1*. Bristol: Centre for Multilevel Modelling, University of Bristol. <http://www.bristol.ac.uk/cmm/software/mlwin/>.
- Browne, W.J. (2015). *MCMC Estimation in MLwiN*. Bristol: Centre for Multilevel Modelling, University of Bristol. <http://www.bristol.ac.uk/cmm/media/software/mlwin/downloads/manuals/2-33/mcmc-web.pdf>.
- Browne, W.J., Steele, F., Golalizadeh, M., and Green, M.J. (2009). The use of simple reparameterizations to improve the efficiency of Markov chain Monte Carlo estimation for multilevel models with applications to discrete time survival models. *Journal of the Royal Statistical Society: Series A (Statistics in Society)* 172(3):579–598. doi:10.1111/j.1467-985X.2009.00586.x.
- Chibber, K.S., Biggs, M.A., Roberts, S.C.M., and Foster, D.G. (2014). The role of intimate partners in women's reasons for seeking abortion. *Women's Health Issues: Official Publication of the Jacobs Institute of Women's Health* 24(1):e131-138. doi:10.1016/j.whi.2013.10.007.
- Ellison, C.G., Echevarría, S., and Smith, B. (2005). Religion and Abortion Attitudes Among U.S. Hispanics: Findings from the 1990 Latino National Political Survey. *Social Science Quarterly* 86(1):192–208. doi:10.1111/j.0038-4941.2005.00298.x.
- Finer, L.B., Frohworth, L.F., Dauphinee, L.A., Singh, S., and Moore, A.M. (2005). Reasons U.S. women have abortions: quantitative and qualitative perspectives. *Perspectives on Sexual and Reproductive Health* 37(3):110–118. doi:10.1363/psrh.37.110.05.
- FINLEX (2013). Laki raskauden keskeyttämisestä [Act on pregnancy termination] 24.3.1970/239 [electronic resource]. <http://www.finlex.fi/fi/laki/ajantasa/1970/19700239>.

- Forssén, K., Laukkanen, A.-M., and Ritakallio, V.-M. (2003). *Policy. The case of Finland*. Paper presented at Welfare Policy and Employment in the Context of Family Change, Utrecht, the Netherlands, October 8–9 2003.
- Frejka, T. and Westoff, C.F. (2007). Religion, Religiousness and Fertility in the US and in Europe. *European Journal of Population / Revue européenne de Démographie* 24(1):5–31. doi:10.1007/s10680-007-9121-y.
- Haataja, A. (2006). *Nordic breadwinner–caretaker models - comparison of Finland and Sweden*. Helsinki: the Ministry of Social Affairs and Health. Reports of the Ministry of Social Affairs and Health, Finland. [http://www.stm.fi/c/document\\_library/get\\_file?folderId=28707&name=DLFE-3693.pdf&title=Pohjoismainen\\_ansaitsija\\_hoivaajamalli\\_fi.pdf](http://www.stm.fi/c/document_library/get_file?folderId=28707&name=DLFE-3693.pdf&title=Pohjoismainen_ansaitsija_hoivaajamalli_fi.pdf).
- Hansen, M.-L.H., Mølgaard-Nielsen, D., Knudsen, L.B., and Keiding, N. (2009). Rates of induced abortion in Denmark according to age, previous births and previous abortions. *Demographic Research* 21:647–680. doi:10.4054/DemRes.2009.21.22.
- Heaton, T., Jacobson, C., and Holland, K. (1999). Persistence and Change in Decisions to Remain Childless. *Journal of Marriage and Family* 61(2):531–539.
- Hess, J.A. and Rueb, J.D. (2005). Attitudes toward abortion, religion, and party affiliation among college students. *Current Psychology* 24(1):24–42. doi:10.1007/s12144-005-1002-0.
- Hoem, J.M., Jalovaara, M., and Muresan, C. (2013). Recent fertility patterns of Finnish women by union status: A descriptive account. *Demographic Research* 28:409–420. doi:10.4054/DemRes.2013.28.14.
- Holland, J.A. (2011). Home and Where the Heart Is: Marriage Timing and Joint Home Purchase. *European Journal of Population / Revue européenne de Démographie* 28(1):65–89. doi:10.1007/s10680-011-9242-1.
- Jalovaara, M. (2012). Socio-economic resources and first-union formation in Finland, cohorts born 1969–81. *Population Studies* 66(1):69–85. doi:10.1080/00324728.2011.641720.
- Johnson-Hanks, J., Bachrach, C.A., Morgan, S.P., and Kohler, H.-P. (2011). *Understanding Family Change and Variation*. Dordrecht: Springer Netherlands.
- KELA (2012). Social Insurance Institution: Parental allowance [electronic resource]. [http://kela.fi/web/en/parental-leave\\_parental-allowance](http://kela.fi/web/en/parental-leave_parental-allowance).
- Kirkman, M., Rowe, H., Hardiman, A., Mallett, S., and Rosenthal, D. (2009). Reasons women give for abortion: a review of the literature. *Archives of Women's Mental Health* 12(6):365–378. doi:10.1007/s00737-009-0084-3.
- Knudsen, L.B., Gissler, M., Bender, S.S., Hedberg, C., Ollendorff, U., Sundström, K., Totlandsdal, K., and Vilhjalmsdottir, S. (2003). Induced abortion in the Nordic countries: special emphasis on young women. *Acta obstetrica et gynecologica Scandinavica* 82(3):257–268.
- Kontula, O. (2010). The evolution of sex education and students' sexual knowledge in Finland in the 2000s. *Sex Education* 10(4):373–386.
- Kosunen, E. (2000). Family Planning Services. In: Lottes, I. and Kontula, O. (eds.). *New Views on Sexual Health - The Case of Finland*. Helsinki: Väestöliitto: 70–84. <https://vaestoliitto->

- fi.directo.fi/tieto\_ja\_tutkimus/vaestontutkimuslaitos/julkaisut/kaikki\_julkaisut\_all\_publication/new\_views\_on\_sexual\_health-the/.
- Kravdal, Ø. (2001). The High Fertility of College Educated Women in Norway: An Artefact of the Separate Modelling of Each Parity Transition. *Demographic Research* 5:187–216. doi:10.4054/DemRes.2001.5.6.
- Kreyenfeld, M. (2010). Uncertainties in Female Employment Careers and the Postponement of Parenthood in Germany. *European Sociological Review* 26(3):351–366. doi:10.1093/esr/jcp026.
- Lappegård, T. and Noack, T. (2015). The link between parenthood and partnership in contemporary Norway - Findings from focus group research. *Demographic Research* S17(9):287–310. doi:10.4054/DemRes.2015.32.9.
- Lappegård, T. and Rønsen, M. (2005). The Multifaceted Impact of Education on Entry into Motherhood. *European Journal of Population / Revue européenne de Démographie* 21(1):31–49. doi:10.1007/s10680-004-6756-9.
- Leckie, G. and Charlton, C. (2013). runmlwin - A program to run the MLwiN multilevel modelling software from within Stata. *Journal of Statistical Software* 52(11):1–40.
- Leone, T. and Hinde, A. (2007). Fertility and union dissolution in Brazil: an example of multi-process modelling using the Demographic and Health Survey calendar data. *Demographic research* 17:157–180. doi:10.4054/DemRes.2007.17.7.
- Lillard, L.A. (1993). Simultaneous equations for hazards. *Journal of Econometrics* 56(1–2):189–217. doi:10.1016/0304-4076(93)90106-F.
- Lillard, L.A. and Waite, L.J. (1993). A joint model of marital childbearing and marital disruption. *Demography* 30(4):653–681. doi:10.2307/2061812.
- Lyngstad, T.H., Noack, T., and Tufte, P.A. (2011). Pooling of Economic Resources: A Comparison of Norwegian Married and Cohabiting Couples. *European Sociological Review* 27(5):624–635. doi:10.1093/esr/jcq028.
- Lyngstad, T.H. and Skardhamar, T. (2011). Nordic Register Data and Their Untapped Potential for Criminological Knowledge. *Crime and Justice* 40(1):613–645. doi:10.1086/658881.
- Mauldon, J., Foster, D.G., and Roberts, S.C.M. (2015). Effect of Abortion vs. Carrying to Term on a Woman's Relationship with the Man Involved in the Pregnancy. *Perspectives on Sexual and Reproductive Health* 47(1):11–18. doi:10.1363/47e2315.
- McQuillan, K. (2004). When Does Religion Influence Fertility? *Population and Development Review* 30(1):25–56. doi:10.1111/j.1728-4457.2004.00002.x.
- Nisén, J., Martikainen, P., Kaprio, J., and Silventoinen, K. (2013). Educational differences in completed fertility: a behavioral genetic study of Finnish male and female twins. *Demography* 50(4):1399–1420. doi:10.1007/s13524-012-0186-9.
- Official Statistics of Finland (2012). Births [electronic resource]. Helsinki: Statistics Finland. [http://www.stat.fi/til/synt/2012/synt\\_2012\\_2013-04-12\\_tie\\_001\\_en.html](http://www.stat.fi/til/synt/2012/synt_2012_2013-04-12_tie_001_en.html).
- Oppenheimer, V.K. (1994). Women's Rising Employment and the Future of the Family in Industrial Societies. *Population and Development Review* 20(2):293–342. doi:10.2307/2137521.

- Perelli-Harris, B. (2014). How Similar are Cohabiting and Married Parents? Second Conception Risks by Union Type in the United States and Across Europe. *European Journal of Population / Revue européenne de Démographie* 30(4):437–464. doi:10.1007/s10680-014-9320-2.
- Perelli-Harris, B., Mynarska, M., Berrington, A., Berghammer, C., Evans, A., Isupova, O., Keizer, R., Klärner, A., Lappegård, T., and Vignoli, D. (2014). Towards a new understanding of cohabitation: Insights from focus group research across Europe and Australia. *Demographic Research* 31:1043–1078. doi:10.4054/DemRes.2014.31.34.
- Rasbash, J., Charlton, C., Browne, W.J., Healy, M., and Cameron, B. (2009). *MLwiN Version 2.1*. Bristol: Centre for Multilevel Modelling, University of Bristol. <http://www.bristol.ac.uk/cmm/software/mlwin/>.
- Regushevskaya, E., Dubikaytis, T., Laanpere, M., Nikula, M., Kuznetsova, O., Haavio-Mannila, E., Karro, H., and Hemminki, E. (2009). Risk factors for induced abortions in St Petersburg, Estonia and Finland. Results from surveys among women of reproductive age. *The European journal of contraception & reproductive health care: the official journal of the European Society of Contraception* 14(3):176–186. doi:10.1080/13625180902916038.
- Steele, F., Goldstein, H., and Browne, W. (2004). A general multilevel multistate competing risks model for event history data, with an application to a study of contraceptive use dynamics. *Statistical Modelling* 4(2):145–159. doi:10.1191/1471082X04st069oa.
- Steele, F., Kallis, C., Goldstein, H., and Joshi, H. (2005). The Relationship between Childbearing and Transitions from Marriage and Cohabitation in Britain. *Demography* 42(4):647–673. doi:10.2307/4147333.
- Väisänen, H. (2015). The association between education and induced abortion for three cohorts of adults in Finland. *Population Studies* 69(3):373–388. doi:10.1080/00324728.2015.1083608.
- Väisänen, H. (2016). Educational inequalities in repeat abortion: A longitudinal register study in Finland 1975-2010. *Journal of Biosocial Science* 48(6): 820-832. doi:10.1017/S002193201600016X.
- Väisänen, H. and Murphy, M. (2014). Social Inequalities in Teenage Fertility Outcomes: Childbearing and Abortion Trends of Three Birth Cohorts In Finland. *Perspectives on Sexual and Reproductive Health* 46(2):109–116. doi:10.1363/46e1314.
- Vikat, A. (2004). Women's Labor Force Attachment and Childbearing in Finland. *Demographic Research Special* 3:177–212. doi:10.4054/DemRes.2004.S3.8.
- Vikat, A., Kosunen, E., and Rimpelä, M. (2002). Risk of postpartum induced abortion in Finland: A register-based study. *Perspectives on Sexual and Reproductive Health* 34(2):84–90. doi:10.2307/3030211.
- White, L. and McQuillan, J. (2006). No Longer Intending: The Relationship Between Relinquished Fertility Intentions and Distress. *Journal of Marriage and Family* 68(2):478–490. doi:10.1111/j.1741-3737.2006.00266.x.