London School of Economics and Political Science

A life course perspective to abortion in Finland

Heini Väisänen

A thesis submitted to the Department of Social Policy of the London School of Economics and Political Science for the degree of Doctor of Philosophy

London, February 2016

Declaration of authorship

I certify that the thesis I have presented for examination for the PhD degree of the London School of Economics and Political Science is solely my own work other than where I have clearly indicated that it is the work of others (in which case the extent of any work carried out jointly by me and any other person is clearly identified in it).

I declare that my thesis consists of 50,335 words and five publishable papers.

Statement of use of third party for editorial help

I can confirm that my thesis was proofread for conventions of language, spelling, and grammar by Lisa Findley.

Abstract

Induced abortion is an understudied topic in part because of a lack of reliable data due to underreporting of abortion in surveys. The debate about whether teen pregnancies push women into socioeconomic disadvantage would benefit from longer follow-up periods and reliable data. This thesis studies which socio-demographic characteristics are associated with the likelihood of abortion, provides more precise estimates than previous studies on the socioeconomic risk factors of repeat abortion, and examines socioeconomic outcomes of women with different teen pregnancy histories. I use register data over the reproductive life span of Finnish women born in 1955–59, 1965–69 and 1975–79 (N=274,908). There is no underreporting of abortion in these data. The thesis consists of four sub-studies. The first examined the socioeconomic gradient in the risk of first abortion using event-history analysis. Low education was associated with higher risk of abortion and the gap increased over time. Selection into education and varying access to family planning services were the likely mechanisms. The second study found an educational gradient in the likelihood of repeat abortion, which has become more common over time, indicating a need of an intervention. The third sub-study examined the association between the timing of abortion and union dissolution using multi-process modelling. There were correlated unobserved characteristics associated with both unstable relationships and a higher likelihood of an abortion. Finally, I compared socioeconomic outcomes of women who had a birth, an abortion, or no pregnancy in adolescence. Results using the Karlson-Holm-Breen mediation method showed teen abortion did not mediate the relationship between parental and own socioeconomic position but teen birth did through accumulation of disadvantage. Overall the results show there is a group of women who do not benefit from contraceptive services as much as others. These findings are of importance, as reliable information on abortion is not typically available.

Acknowledgements

Writing the acknowledgements section is surprisingly difficult. Over the years I spent planning and writing this thesis many people have provided me help and support. I would like to mention everyone here, but I would probably run out of space. Thus, I would like to begin by thanking each of these individuals regardless of whether your name is mentioned below.

The biggest thanks go to my supervisors Mike Murphy and Tiziana Leone. Thank you for the hours you have spent thoroughly commenting my work and for teaching me how to do research. I would also like to thank Mikko Myrskylä, who stepped in and acted as my supervisor during Tiziana's maternity leave.

This thesis would not have been written without the help of the people I used to work with in Helsinki before moving to London to study at LSE. I am grateful to Markus Jokela, Mika Gissler, and Anna Rotkirch for their help in obtaining the dataset and their support and advice ever since. Thank you for being warm and inspiring colleagues who I always enjoy coming back to.

While on the subject of inspiring colleagues, I would like to thank my fellow PhD students. Thank you also for being great friends. Elizabeth Bailey, Ellie Suh, Milo Vandemoortele, Melissa Shannon, Valeria Cetorelli, Thais Lombardi, Emilie Courtin, Rikki Dean, Lamia Irfan, Alice Goisis, Emily Freeman, Eleri Jones, Ellie Hukin, Paul Bouanchaud, Ewa Batyra, Madeleine Stevens, Lisa Trigg, Ben Wilson, Else Knudsen, Sam Lattof, and everyone else not included in this list: I would have not made it without you.

I am grateful for the Guttmacher Institute for hosting me for three months during my doctoral studies. During that period I learnt incredibly much about sexual and reproductive health issues in different parts of the world. Many thanks to Rachel Jones, Ann Moore, Susheela Singh, and all the others in the Guttmacher Research Division for working with me and for hosting me.

I would like to thank the staff at the LSE Social Policy department and the Methodology Institute for interesting discussions in seminars and elsewhere. Special thanks go to Emily Grundy, Ernestina Coast, Jouni Kuha, Arjan Gjonca, and Berkay Ozcan. Many thanks to Sarah Helias for providing all the admin support I needed.

This thesis was generously funded by the Economic and Research Council Doctoral Studentship. I would like to thank Statistics Finland and the National Institute of Health and Welfare in Finland for the permissions to use these data.

Last but certainly not the least I would like to thank my family. I am grateful to my mother Pirjo and father Esko for their love and support. My partner and significant other Mikael has lived by my side and supported me throughout the ups and downs of the thesis process. I cannot express how much that means to me. Thank you.

To my family, for their love and support

Table of contents

List of tables

List of appendix tables

List of figures

List of appendix figures

List of abbreviations

ACF: Autocorrelation plot (diagnostic tool for MCMC multi-process modelling).

DIC: Bayesian deviance information criterion

ESS: Effective sample size (diagnostic tool for MCMC multi-process modelling).

IUD: Intra-uterine device (a long-acting reversible contraceptive method).

IGLS: Iterative generalised least squares model.

KHB: Karlson-Holm-Breen method of mediation.

LARC: Long acting reversible contraception.

MCMC: Markov Chain Monte Carlo method.

MCSE: Monte Carlo standard error of the posterior estimate (diagnostic tool for MCMC multi-process modelling).

PACF: partial autocorrelation plot (diagnostic tool for MCMC multi-process modelling).

SE: Standard error.

SES: Socioeconomic status.

TAR: Total abortion rate.

TCA: Theory of conjunctural action.

THL: National Institute for Health and Welfare in Finland.

WHO: World Health Organization.

1. Introduction

1.1 Motivation: why it is important to study abortion

Induced abortion is an important aspect of fertility behaviour in many societies, as it can be used to postpone, space, stop or avoid childbearing (Bankole, Singh, and Haas 1998). Despite its importance the phenomenon remains understudied (Gissler 2010) and to the best of my knowledge, no studies have investigated abortion[1] within the context of the entire reproductive life course of women or compared the behaviour of different cohorts. The lack of research is in part due to difficulties in collecting reliable information on abortion. Due to stigma attached to abortion, many women are reluctant to report such experiences in surveys even when access to abortion is not restricted by law in their country of residence. For example, it has been estimated that more than a half of abortions are not reported in surveys in the United States (Jones and Kost 2007). Data extracted from administrative registers rather than from individuals' own reports overcome these issues. However, few countries of the world routinely collect data on abortion that can be linked with other socio-demographic characteristics of the women and compared to such characteristics of women who never had an abortion. Data extracted from administrative registers in Finland provide a rare exception and a rich resource for studying induced abortion. Despite this, these data remain underused (Gissler 2010).

There is an ongoing debate regarding whether teen pregnancy should be regarded as a social problem. While some studies argue that teenage childbearing leads to adverse outcomes (e.g. Kane et al. 2013; Wilkinson and Pickett 2010), others indicate that given the difficult socioeconomic position of a typical teenage mother, early childbearing might be rather beneficial, or at least not harmful, for the mother (Belsky, Steinberg, and Draper 1991; Lawlor and Shaw 2002). Many studies have attempted to show a causal effect between teen motherhood and low socioeconomic outcomes using quasi-experimental methods (Geronimus and Korenman 1992; Hoffman, Foster, and Furstenberg Jr. 1993; Kane et al. 2013; Lee 2010). The debate would benefit from a fresh angle, which instead of aiming to establish a causal effect would focus on comparing the socioeconomic pathways women take depending on the timing and outcome (birth or induced abortion) of their first pregnancy.

[1] Refers to induced abortion unless otherwise stated.

1.1.1 Why Finland?

High-income countries with low rates of abortion and with seemingly equal access to family planning services and contraceptives have typically overlooked the need for research on reproductive health issues. Finland's abortion rate is relatively low if compared to other countries with similar culture and legislation (see section 1.3.3), contraceptive clinics are available in all municipalities (see section 1.4.3) and sex education has been a compulsory part of primary and lower secondary education since the early 1970s (see section 1.4.2). In addition, policies ranging from income support to government-subsidised day-care and education services support families, increase gender equality, and reduce the costs of childbearing (see section 1.4.2). Finland can thus be regarded as an example of a country, where the importance of sexual and reproductive health has been understood and policies have been put in place to support its residents in these aspects of their lives.

However, there might be groups of women who have not benefited from the country's family planning services and policies to the same extent as other women. Previous studies in Finland have indicated that there is an association between low socioeconomic position and high risk of abortion (Klemetti et al. 2012; Niinimäki et al. 2009; Regushevskaya et al. 2009), which implies that there is a need for more detailed descriptions of these characteristics and their changes over time. Understanding which groups of women are more likely to be left behind when universal family planning policies and policies supporting families with children are created may help researchers and policy-makers to plan how to reach all groups of the population.

There is a lack of population-wide studies of contraceptive and family planning service use in Finland, as the existing estimates are outdated (Hemminki et al. 1997; Kosunen et al. 2004), or ignore significant parts of the population, such as all women younger than age 30 (Koponen et al. 2012). However, it has been argued that a high likelihood of abortion indicates that there is an unmet need for family planning (Sedgh et al. 2013). Thus, understanding which socio-demographic characteristics are associated with a higher risk of abortion and in which stages of life women are more likely to terminate a pregnancy, helps researchers and policy-makers to better address family planning service provision.

The quality of data on induced abortion available in Finland is exceptional even within the context of Nordic countries, which all have rich resources of administrative registers that can be linked in order to form longitudinal datasets not subject to response bias, attrition and underreporting. As outlined in chapter 2.1, Finland and Denmark are the only Nordic countries in which individual-level linkage of abortion data to other registers is possible (Gissler 2010).

1.1.2 Pathways to unintended pregnancies and abortions

Abortion often is a consequence of an unwanted pregnancy. Unwanted pregnancies are typically unintended, but not all unintended pregnancies are unwanted. Contraceptive failure or lack of contraceptive use despite no intention to become pregnant, may lead to an unintended pregnancy. There is a large body of literature examining the determinants and consequences of such pregnancies (e.g. Gipson, Koenig, and Hindin 2008; Santelli et al. 2003; Singh, Sedgh, and Hussain 2010; Wildsmith, Guzzo, and Hayford 2010).

The definition of an unintended pregnancy typically includes two aspects: it was either unwanted (not wanted at all) or mistimed (happened too early) (Wildsmith, Guzzo, and Hayford 2010). Complex social and economic factors affect individuals' pregnancy intentions (Santelli et al. 2003). For instance, age, relationship status, socioeconomic status (SES), family and religious background, peer influence and availability of social support affect individuals' fertility intentions (Kelhä 2010; Wildsmith, Guzzo, and Hayford 2010). Poverty, stigma related to the pregnancy, work and family conflict, completion of or disagreement on family size, lack of support from partner and poor access to contraceptives are reasons women typically give, when asked why they did not plan to become pregnant at the time of conception (Singh, Sedgh, and Hussain 2010).

There are problems in measuring pregnancy intentions as prospective and retrospective reporting of these intentions tend to differ and classifying all pregnancies into one of the categories of 'wanted', 'mistimed' and 'unwanted' may not describe the variety of pregnancy intentions accurately (Gipson, Koenig, and Hindin 2008; Trussell, Vaughan, and Stanford 1999). Pregnancy may be unintended but become wanted, once it occurs. For example, 40 per cent of contraceptive failures in the United States in 1995 eventually became wanted pregnancies (Trussell, Vaughan, and Stanford 1999). Reports of pregnancy intentions regarding births that occurred do not match well with intentions before conception (Morgan and Bachrach 2011). Sometimes an initially intended

pregnancy becomes unwanted due to a change in life circumstances. However, according to a British study, this is rather uncommon (Barrett and Wellings 2002).

The likelihood of unintended pregnancy and consequently, of abortion, varies over the life course and so do fertility intentions. Incidentally, in many countries, women in their twenties have more abortions than women in other age groups, whereas teenagers and women aged 35 or older most often have the lowest abortion rates. Teenagers may have lower abortion rates than women in their twenties due to fewer of them being sexually active and sexual activity being more sporadic than among older women (Sedgh et al. 2013).

Although this study does not include information on pregnancy intentions, it is important to acknowledge that these dynamics play an important role in determining the incidence of abortion. Women who want to avoid childbearing but are not able to use contraceptives consistently and efficiently have a higher risk of an unintended pregnancy, and subsequently of an abortion although not all unintended or unwanted pregnancies end in abortion. However, in my study it is not possible to distinguish between wanted and unwanted births.

1.2 The life course framework

This thesis aims to study abortions within the context of the stage of the life course the women are in. Individuals make choices within the limits of the environmental and socioeconomic factors affecting their lives. The timing of events may have consequences, which unfold only several years after the event (Elder, Kirkpatrick, and Crosnoe 2003). Therefore, the number and timing of births and abortions is understood as a result of a series of decisions depending on the stage of life of the individual (Morgan and Hagewen 2005).

Life course approaches are sometimes divided into accumulation and pathway models. The former focuses on accumulation of (dis)advantage, and is widely used in health studies investigating the effect of socioeconomic status on health at old age. The hypothesis is that the more disadvantageous labour market positions people have had, the worse health they tend to possess in old age due to stress and differences in health-related behaviours. The pathway model is essentially similar, but focuses on different pathways individuals take after certain life events. For instance, highly educated women may postpone entering parenthood and thus have higher risk of breast cancer than those who

started childbearing earlier (e.g. Blane, Netuveli, and Stone 2007; Kuh et al. 2003; Singh-Manoux et al. 2004). The impact of the events depend on their timing (Hallqvist et al. 2004). For instance, a birth may have a stronger impact on a woman's socioeconomic position if it happens in adolescence rather than in adulthood (see Chapter 6).

Morgan and Bachrach (2011) stress the importance of flexibility for theory: intentions and behaviour change during the life course. They created a theoretical framework called *theory of conjunctural action (TCA)*, which is based on social theory, psychology and the life course framework. It takes into account conscious and unconscious processes leading to behaviour and the effect of social context on the process. For instance, fertility intentions may result from normative schemas people have regarding the concept of family. Therefore, expressing an intention to have two children may not be a commitment to act accordingly, but a result of an unconscious schema. Moreover, sometimes intentions not directly related to fertility drive fertility behaviour, such as not aborting an unwanted pregnancy due to ambivalent feelings towards abortion or childbearing in general. Another example is commitment effect: re-marrying increases the likelihood of having a(nother) child, because the spouses wish to show commitment to each other. Therefore, having many unions may result in higher fertility than among those who had fewer unions (Balbo, Billari, and Mills 2013). Furthermore, the theory implies that women's reproductive behaviour differs depending on their social class: women with low education more often start childbearing before marriage or stable employment than women with high education (Johnson-Hanks et al. 2011).

The decision to have an abortion depends on the woman's stage of the life course. The socioeconomic position of a woman may depend on her timing of childbearing (e.g. Geronimus and Korenman 1992; Hoffman, Foster, and Furstenberg Jr. 1993; Kane et al. 2013; Lee 2010), which can be changed by obtaining an abortion. Most importantly, obtaining an abortion may postpone, limit, or space births. For example, terminating one's first pregnancy in adolescence may be intended to postpone entry into motherhood; sometimes a new pregnancy starts too soon after giving birth, in which case an abortion may be used to space births; or a pregnancy that occurs after having already completed desired family size may be terminated in order to stop childbearing (Bankole, Singh, and Haas 1998; Sedgh et al. 2013). In Chapter 6, I compare the socioeconomic pathways of women with different birth and abortion histories and show that the socioeconomic outcomes of women are associated with their pregnancy histories. Section 3.1 shows how

the likelihood of abortion varies by education and age, implying that pregnancy decisions depend on the stage of the life course of the woman—not only on her age but also on achieved education and other socioeconomic characteristics (see also section 3.2). Also, duration and quality of woman's romantic relationship is associated with the likelihood of abortion, as women have a higher risk of abortion shortly before or after a union dissolution (see Chapter 5).

The decision to have an abortion cannot be entirely explained by theories or frameworks of fertility behaviour. Women's fertility intentions, contraceptive use, sexual activity, and willingness to terminate an unintended pregnancy affect their likelihood of having an abortion (Bongaarts 1978). These characteristics may depend on the socio-demographic characteristics of the women. Women choose abortion if the pregnancy they are carrying is 'unsustainable' at the given time and situation of life (Coast, Norris, and Freeman 2015). This 'unsustainability' can be due to a number of reasons, such as lack of suitable partner, economic difficulties, or the pregnancy being unwanted or mistimed (Finer et al. 2005; Santelli et al. 2009). The likelihood of abortion is difficult to predict based on theories explaining how and why women's fertility intentions change throughout the life course due to differences in contraceptive use. For instance, studies have found that older women and those with higher education are more likely to use effective contraceptive methods than young and poorly educated women (e.g. Sedgh et al. 2013) even in situations where both groups wish to avoid a pregnancy. There may also be differences in their fecundity, which changes by age (The American College of Obstetricians and Gynecologists Committee on Gynecologic Practice and The Practice Committee of the American Society for Reproductive Medicine 2014), and subsequently the likelihood of becoming pregnant in the event of contraceptive failure. Highly educated women may have fewer abortions than those with low education as they often are less likely to experience an unintended pregnancy in the first place due to more effective contraceptive use. Differences in fecundity may also matter in some cases. Thus, incidence of abortion should not be interpreted as an indication of strength of the motivation to avoid childbearing between different groups of the population. Instead, it should be understood, among other things, as an indication of a need for better access to and knowledge of family planning services.

1.3 Abortion trends in different parts of the world

This section summarises worldwide abortion trends and trends in selected sub-regions of the world. More detailed reviews of the literature regarding the determinants of first or repeat abortions, teenage pregnancies or the association between relationship dynamics and abortion can be found in the respective sub-studies. After summarising the worldwide trends, I describe the situation in other high-income countries, such as the United States, Canada and European countries. Finally, I present abortion trends in Finland over time.

1.3.1 Abortion worldwide

The global abortion rate has been estimated between years 1990 and 2014 (Sedgh et al. 2016). The estimates of the number of abortions range from 50.4 million in 1990–94 to 56.3 million in 2010–14. The number of abortions per 1000 women aged 15 to 44 was 40 in 1990–94 and it declined to 35 in 2010–14. Approximately every fourth pregnancy in the world ends in abortion (Sedgh et al. 2016). Studying these figures separately in developed and developing regions of the world shows that although the rates have fallen in the developed world (from 46 to 27 per 1000 women between 1990–94 and 2010–14, respectively), in the developing world the rates have stalled (it fell from 39 to 35 1000 women between 1990–94 and 2000–04, respectively, but has remained around 35 ever since (Sedgh et al. 2016)). The authors suggest that abortion rates have not fallen in the developing countries despite investments in family planning services due to continued unmet need for contraception, desire for smaller families, and growing motivation to control timing and number of births (Sedgh et al. 2016). The stalling of the rate in the developing regions of the world may explain, why the world abortion rate has also stalled.

It has been estimated that depending on the country, the total abortion rate (TAR), which is the average number of abortions a woman would have should the current age-specific abortion rates continue throughout her reproductive life, ranges from 0.2 to more than one (Sedgh et al. 2007).

Although half of all abortions have been estimated to be unsafe[2], only up to six per cent of unsafe abortions take place in developed countries, and in areas like Northern Europe the percentage is negligible. Abortion rates are typically lower and morbidity and

[2] The World Health Organization (WHO) defines unsafe abortion as ‘a procedure for terminating a pregnancy performed by persons lacking the necessary skills or in an environment not in conformity with minimal medical standards, or both’ (WHO and Maternal Health and Safe Motherhood Programme 1993).

mortality associated with abortion rarer in regions where abortion legislation is liberal; that is where abortion is allowed on request, on socioeconomic grounds, or to preserve the physical or mental health of the woman (when the latter condition is interpreted liberally). This might be due to fewer abortions being obtained in areas with liberal legislation, because that typically correlates with better availability of contraceptives and a reduced need to induce abortions unsafely (Sedgh et al. 2012).

1.3.2 Abortion in North America and Europe

In Northern America (Canada and the United States) abortion declined from 25 per 1000 women in 1990–94 to 17 per 1000 women in 2010–14. Seventeen to 23 per cent of pregnancies were estimated to end in abortion in this area during this period of time (Sedgh et al. 2016). Unsafe abortions in this region are rare (less than five per cent of all abortions) (Sedgh et al. 2012).

In Europe, the abortion rate was 52 per 1000 women aged 15 to 44 years in 1990–94 but declined markedly to 30 per 1000 women in 2010–2014. The abortion rate was higher in Eastern Europe (between 42 and 88 per 1000 women during the period) than in the other areas of Europe (13 to 38 per 1000 women, depending on year and area). Four in ten pregnancies were estimated to have ended in abortion in Europe in 1990–94, which was reduced to three in ten in 2010–2014 (Sedgh et al. 2016). The rate of unsafe abortions ranged from 13 per 1000 women in Eastern Europe to negligible in Northern Europe between 1995 and 2008 (Sedgh et al. 2012).

Teenage abortion rates (that is, the abortion rate per 1000 women of the age between 15 and 19 years) varied from five per 1000 women in Switzerland to 20 in Sweden and England and Wales among the 21 countries[3] for which complete data from year 2011 (or 2008-2010 in some cases) were available in a review by Sedgh and colleagues (2015). Between 17 per cent (Slovakia) and 69 per cent (Sweden) of teen pregnancies ended in abortions. Finland's teen abortion rate was 13 per 1000 women, which was about average. Fifty-five per cent of teen pregnancies ended in abortion in Finland, which was also an average figure (Sedgh et al. 2015).

[3] Belgium, Denmark, England & Wales, Estonia, Finland, France, Hungary, Iceland, Israel, the Netherlands, New Zealand, Norway, Portugal, Scotland, Singapore, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United States.

1.3.3 Abortion in Finland

Finnish abortion patterns are distinctly different from Eastern European countries with high abortion rates (Denisov, Sakevich, and Jasilioniene 2012). In fact, there are relatively fewer abortions in Finland than in most of the other high-income countries with liberal abortion legislation. The total abortion rate decreased from 0.4 in 1980 to 0.3 since the mid-1990s to the present[4]. It is one of the lowest TARs in Europe and North America. For instance, in the 1990s and 2000s the TAR for England and Wales was around 0.5, for the United States around 0.6, and for Russia higher than one (Sedgh et al. 2013). Lower TARs than in Finland have been observed, for example in the Netherlands, Belgium, and Germany (all between 0.19 and 0.27 in the period from 1995 to 2009) (Sedgh et al. 2013).

The lowest abortion rate recorded in Finland between 1970 and 2010 (which is the period of this study) was 7.8 per 1000 women in 1995 and the highest 19.7 in 1973. Nowadays the rate is approximately 9 per 1000 women. Even among the Nordic countries, despite the similarities in legislation and culture, Finland has had the lowest abortion rate since the early 1980s (Gissler and Heino 2011). In 2006, only Germany, Belgium and the Netherlands had lower abortion rates than Finland among Western countries with liberal abortion legislation (Denisov, Sakevich, and Jasilioniene 2012). The total number of abortions in Finland decreased from 21,547 in 1975 to 9,872 in 1995. Since 2000 there have been around 11,000 abortions per year (Vuori and Gissler 2013).

In 2000 it became legal to induce abortions by drugs in Finland. Ever since, the proportion of surgical abortions has declined rapidly. For instance, although 89 per cent of abortions were surgical abortions in 2000, ten years later only around 14 per cent of abortions were induced using this method[5] (Heino, Gissler, and Soimula 2011). The Current Care Guidelines (2013) of induced abortion in Finland state that any woman obtaining an abortion should make the choice between the surgical and medication abortion together with her doctor. A study of Finnish women obtaining abortions in

[4] I calculated the rate from the number of abortions in five-year age groups (Vuori and Gissler 2013) and the number of women in each age group (Official Statistics of Finland 2013b).

[5] As the last evaluation study of the Register of Induced abortion was conducted before it became legal to induce abortion by drugs in Finland (see Gissler et al. 1996), it is difficult to assess, whether the data regarding medical abortion are of equal quality with data on surgical abortion. However, the report by Heino and colleagues (2011) states that the data submitted by hospitals is compared with other registers (Medical Birth Register, Care Register) and in unclear cases the hospital is contacted, indicating that the data are of good quality regardless of the method used to induce the abortion. The hospitals are required to report the abortion using the same procedures regardless of the method of abortion (Heino, Gissler, and Soimula 2011).

Helsinki concluded that women who preferred to induce the abortion by medication chose the procedure because they wanted to avoid surgical intervention and general anaesthesia, and perceived it as a more natural method than surgery (Honkanen and von Hertzen 2002). A review of the international literature on the topic reached largely the same conclusions in contexts similar to Finland when it comes to abortion provision (Ho 2006).

Like in other countries of the world (Sedgh et al. 2013), the incidence of abortion varies by age in Finland. Figure 1.1 shows the number of abortions per 1000 women of the same age, measured every five years between 1970 and 2010 based on figures provided in the report by Heino and colleagues (2011). Apart from the mid-1980s when adolescents (women aged 15 to 19 years) had the highest abortion rate, women aged 20 to 24 have had more abortions than women in the other age groups. These figures are in line with the finding by Sedgh and colleagues (2013), suggesting teenagers' lower abortion rates compared to women in their twenties may be due to fewer adolescents being sexually active and their sexual activity being more sporadic than among older women. Women in their 30s and 40s had fewer abortions than younger women.

Teen abortion rate increased in the late 1990s and early 2000s (Figure 1.1) partly because sex education in schools was no longer compulsory due to austerity measures the government put in place in the mid-1990s following a severe economic depression Finland went through after the Soviet Union collapsed in the early 1990s (Honkapohja and Koskela 1999; Kontula 2010; Väisänen and Murphy 2014). Sex education was made compulsory again in 2001 after which the teen abortion rate started declining again (Heino, Gissler, and Soimula 2011; Kontula 2010; also see Figures 1.1 and 1.3).

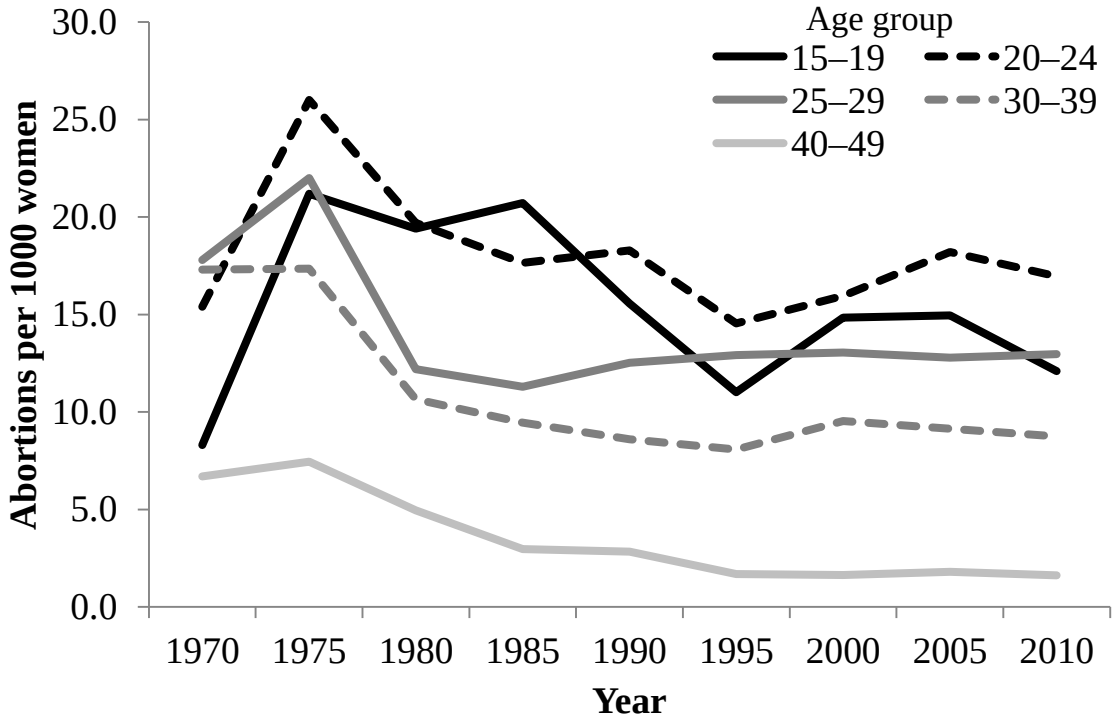


Figure 1.1. The number of abortions per 1000 women of the same age in Finland 1970–2010. Source: Heino, Gissler, and Soimula 2011.

Most abortions in Finland are early abortions. Since the mid-1980s, only between five and eight per cent of abortions have taken place after the end of 12 weeks of gestation. The so-called social indication of abortion is the most often cited reason for abortion (see section 1.4.1 for more information on abortion legislation in Finland and on the types of reasons women must provide in order to get a termination of pregnancy). It refers to socioeconomic circumstances that prevent carrying the pregnancy to term and it is cited in more than 95 per cent of abortions in Finland nowadays (Heino and Gissler 2012).

Table 1.1 summarises the proportion of abortions due to different indications between 1970 and 2010. There were more abortions due to medical problems of the foetus or one of the parents in year 1970 than in the later years probably because legislation permitting abortion for social reasons came into force in June 1970, and it may have taken time for the practice of recording this as the reason to become established.

Table 1.1. Indications of abortions in Finland 1970–2010 (%).

Year	Social	Medical*	Ethical**	(Total=100%) N
1970* **	54.8	45.2	0.2	14,757
1975	92.6	7.4	0.0	21,547
1980	95.3	4.7	0.0	15,037
1985	96.8	3.1	0.1	13,787
1990	97.6	2.4	0.0	12,217
1995	97.5	2.5	0.0	9,872
2000	97.6	2.3	0.1	10,933
2005	96.7	3.2	0.1	11,253
2010	96.3	3.6	0.1	10,694

* Medical reason of the foetus, mother or father.
** The so-called 'ethical' indication means cases of rape or incest.
*** The law changed on 1 June 1970 (Keski-Petäjä 2012) so the medical abortions reported this year are different from the ones reported later on.

1.4 The Finnish context

1.4.1 Abortion legislation and attitudes towards abortion

In Finland, there are no substantial limitations on obtaining abortions within the first trimester of the pregnancy such as high costs or restrictive legislation, so women can be relatively confident that they will be able to safely terminate a pregnancy should they wish to do so. Abortion legislation in Finland has been quite liberal since June 1970, although some limitations still apply. In addition, attitudes towards abortions are liberal according to surveys. These aspects are discussed in more detail below.

Before 1950 abortions were illegal in Finland unless the woman's life or health was at risk. Between 1950 and 1970 abortions were allowed mainly for medical reasons, but in theory the law allowed taking social distress into account (Keski-Petäjä 2012). A more liberal law was introduced in 1970 and the same legislation still holds today. Abortions on request are not permitted, but permission is granted, if at least one of the following indications is fulfilled:

> (1) considerable strain caused by living or other condition (so-called social reason), (2) age <17 years, (3) age ≥40 years (4), woman has given birth to at least four children (5), medical reasons of the woman (pregnancy is a risk for her life or health, her sickness, physical defect or infirmity or she is not able to take care of the child), (6) medical reason of the father (he is not able to take care of the child), (7) medical reason of the foetus (mental deficiency, severe illness or handicap), and (8) ethical reasons including rape, incest and other reasons mentioned in the penal code (Knudsen et al. 2003, pp. 260–261).

Nowadays, an early abortion (up to the end of 12 weeks of gestation) is practically always granted on social grounds if the woman applies for it (Knudsen et al. 2003). If the

woman is younger than 17 years old, or there is another special social reason for pregnancy termination, abortion can be permitted up to the end of 20 weeks of gestation (FINLEX 2013). Two physicians' approval is needed before abortion is granted, unless abortion is due to age or parity (indications 2, 3 or 4 above), in which case one approval is enough (Knudsen et al. 2003). If abortion is performed after 12 weeks of gestation, permission has to be obtained from the National Supervisory Authority for Welfare and Health (FINLEX 2013).

Gestational limits for abortion have fluctuated somewhat after the new abortion legislation came into force in 1970. Until 1978 abortions were allowed until the end of 16 weeks of gestation unless there was a severe medical problem with the foetus, in which case abortion was possible until the end of 20 weeks. In 1978 the general limit was reduced to the end of 12 weeks of gestation. Since 1985 the limit due to a medical problem with the foetus has been the end of 24 weeks of gestation. There has never been a gestational limit to abortion if the woman's life or health is at risk (Knudsen et al. 2003).

In countries where abortion legislation is liberal and access to legal abortion services is relatively easy and affordable, abortions are typically performed safely and legally. However, when gestational limits apply, some women may have to either travel or use illegal methods, if it is too late to obtain an abortion within the legal limits in their own country (Sedgh et al. 2013). Illegal abortions are assumed to be extremely rare in Finland (Hemminki et al. 2008). For instance, there were only a few dozen complications due to illegal abortions treated in hospitals in the early 1990s (Ritamies 1993). More thorough or recent estimates of illegal abortion in Finland were not available.

Compared to other European counties with liberal abortion legislation, the Finnish legislation is one of the strictest due to strict gestational limits and the need of two medical doctors' approval (see Table 1.2). Abortion is available on request in most Nordic countries (Sweden, Denmark and Norway; but not in Iceland) (Knudsen et al. 2003; Levels, Sluiter, and Need 2014), but the Finnish parliament is currently not planning to introduce such legislation. The Center of Reproductive Rights (2015) classifies Finland's abortion law into the third category in their four-category scale, where one signifies the most restrictive (abortion not permitted or only permitted to save the woman's life) and four the most liberal type of abortion law (abortion permitted on woman's request). The other European countries in that category are Britain and Iceland. According to the Center of Reproductive Rights, the European countries which belong to a more restrictive

category than Finland are Ireland and Northern Ireland, Poland, Andorra, Monaco, San Marino, Malta, and Liechtenstein. All the other European countries were classified into the fourth (most liberal) category in 2015 (Center for Reproductive Rights 2015).

Table 1.2. Abortion legislation in selected European countries*.

	Finland	**Sweden**	**Russia**	**England & Wales**	**The Netherlands**
Liberal legislation	1970	1975	1955	1967	1981
Abortion on request	No**	Yes	Yes	No**	No**
Upper week limit (social)	12 (20)***	18	12 (22)	24	22
Upper week limit (medical)	24	Until foetus able to survive ex-utero.	No upper limit.	After 24 weeks in special circumstances.	No upper limit.
Other information	No week limit if threat to woman's health or life.	In 1946 abortion was allowed due to socio-medical stress and in 1963 due to foetal disorders.	Abortion allowed up to 22 weeks due to special social indications.	Abortion allowed if risk to mental or physical health of woman.	Need to state that the pregnancy causes serious distress that cannot be resolved by any other means.

* Sources: Denisov, Sakevich, and Jasilioniene 2012; Gissler et al. 2012; Knudsen et al. 2003; Levels, Sluiter, and Need 2014; NHS 2012.

** Although abortion is not available on request in Finland, the Netherlands and the UK, the legislation is interpreted liberally and abortions are permitted almost without exceptions on the grounds of socioeconomic situation, mental health reasons, or 'distress' as defined by the woman herself as long as the gestational limits are met (Levels, Sluiter, and Need 2014). The Center of Reproductive Rights defines the Netherlands to the most liberal category of abortion law, as no third-party assessment of distress is needed (Center for Reproductive Rights 2015; Levels, Sluiter, and Need 2014).

*** See text.

Attitudes towards abortion are quite liberal: in 1989, five per cent of Finnish women were against abortion in all situations, whereas half of the female population accepted abortion due to social indication (Notkola 1993). In 2007, 65 per cent of Finns accepted abortions on woman's request (Kontula 2008). According to the World Values Survey, abortion attitudes in Finland are less liberal than in Sweden, but similar to those in Great Britain and Russia based on the two waves of the study, when the question was asked in the respective countries (waves 3 and 5 conducted in 1994-1999 and 2005-2007, respectively). In the two latter countries the attitudes have become less approving, whereas in Finland the acceptability increased between the two time points (World Values

Survey Association 2009). Figure 1.2 summarises these trends in the four countries. The anti-abortion movement is not strong in Finland.

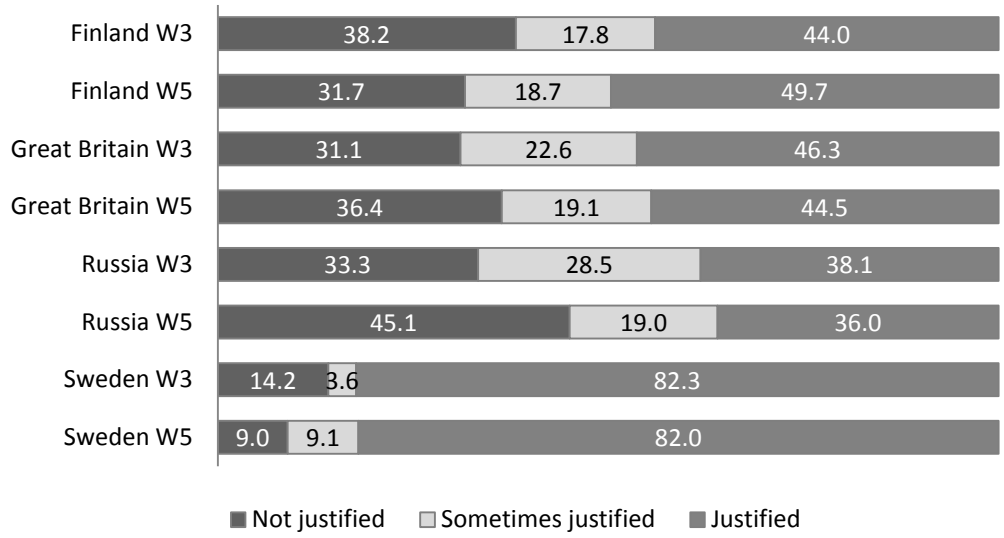


Figure 1.2. Justification of abortion (%) in selected European countries in 1994-1999 (W3) and 2005–2007 (W5). Data source: World Values Survey Association 2009.[6]

1.4.2 Family policies and access to abortion

In Finland, policies aiming to reduce unintended pregnancies and the number of abortions, such as sex education, family planning services and easy and cheap access to contraception have been implemented ever since abortion legislation became liberal in 1970 (Keski-Petäjä 2012; Kontula 2010; Ritamies 1993; Sydsjö, Josefsson, and Sydsjö 2009). Sex education was introduced in schools in 1970 and apart from the recession years in the 1990s it has been a compulsory part of the curriculum ever since (Kontula 2010). All municipalities have been required to provide family planning services since 1972 (Kosunen 2000). Figure 1.3 summarises the most important policy changes since 1970.

[6] Justification of abortion was measured using a scale from 1 to 10, where 1 meant "never justified" and 10 "always justified" in response to the question "*Please tell me for each of the following actions whether you think it can always be justified, never be justified, or something in between, using this card*" (World Values Survey Association 2009). Most people chose 1, 5 or 10, leaving the categories in between only rarely used. Therefore, I recoded this into three categories: Not justified (values 1-4), sometimes justified (5), and Justified (6-10).

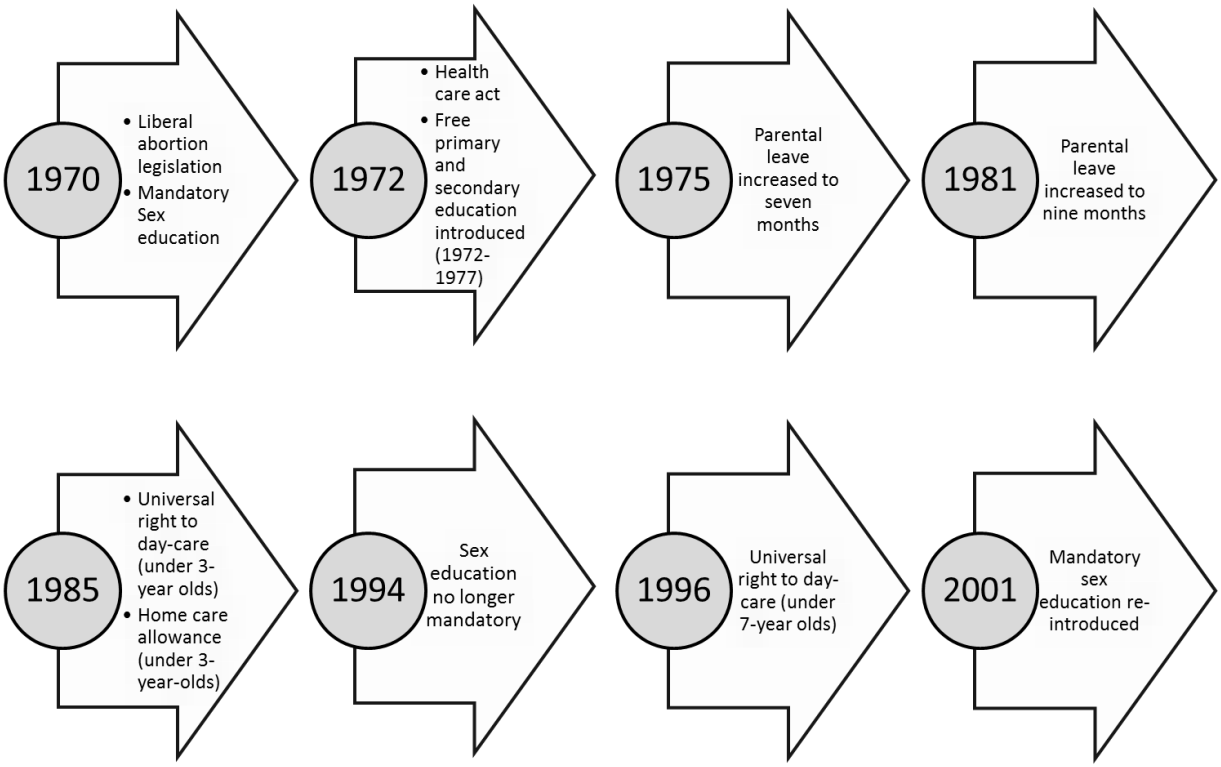


Figure 1.3. Family policy timeline in Finland since 1970.

Policies, which may indirectly decrease the number of abortions by reducing costs of childbearing, have been implemented in Finland since the late 1940s when a universal child benefit paid to all families was introduced (Forssén, Laukkanen, and Ritakallio 2003). These benefits and rights went through crucial changes in the 1970s and 1980s. In the mid-1970s parental leave was increased from three to seven months. Parental allowance is paid during parental leave. It typically amounts to around 70 per cent of income prior to childbearing (KELA 2012), thus reducing the direct costs of childbearing. Since the mid-1980s a home care allowance system has permitted a parent to stay at home without losing his or her job until the 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 the age of three since 1985 and under the age of seven since 1996 in cheap[7] and high-quality public nurseries (Haataja 2006; Vikat 2004) and the high-quality education system, which is free of charge from primary school to higher education, further decrease the costs of childbearing and facilitate combining work and family life.

[7] The cost depends on the income of the parents to ensure everyone pays an amount that is not too expensive for them.

Abortions are currently provided at low cost in the public healthcare sector—for example, one of the hospital districts charges between €30 and €100 depending on the duration of the pregnancy and whether it is a medical or surgical termination (YTHS 2014), and the costs in other districts are similar. Financial help is available for those unable to pay.

1.4.3 Contraceptive use and unintended pregnancies

Contraceptive use patterns appear to have been stable in Finland across decades, although there is a lack of studies and data on the topic and thus I had to rely on limited information (Hemminki et al. 1997; Koponen et al. 2012; Kosunen et al. 2004; Makkonen and Hemminki 1991). In 2011, 13 per cent of women aged 30 to 54 used oral contraceptives, a vaginal ring or a contraceptive patch; 26 per cent a copper or hormonal intra-uterine device (IUD); and 14 per cent condoms. Women were allowed to report more than one method and no information of women younger than age 30 was reported (Koponen et al. 2012). In 2000, 20 per cent of women aged 18 to 54 used the pill, and almost as many used IUDs. The pill was the most popular method among women younger than 30 years, whereas IUDs were more often used by women age 30 or older. Around 40 per cent of women under the age of 30 had recently used a condom, even if some of them were also using another method (pill or IUD). Condom use was not asked from women older than 30. Highly educated women often used a hormonal method (pill or hormonal IUD), whereas copper IUDs were more common among women with lower education (Kosunen et al. 2004). In 1994, 75 per cent of Finnish women aged 18 to 44 used some form of contraception (30 per cent of users used the pill, 20 per cent condoms, 18 per cent IUD and nine per cent sterilisation). As in 2000, young women were more likely to use oral contraceptives or condoms, whereas IUDs and sterilisation were more common among women older than 30 (Hemminki et al. 1997). In the 1970s and 1980s, use of IUDs was more common in Finland than in other Nordic countries (Makkonen and Hemminki 1991).

Although all municipalities have been required by law to provide family planning services since the implementation of the 1972 Primary Health Care Act (FINLEX 1999; Hemminki et al. 1997), access is not necessarily equally easy for women in all socioeconomic groups. First of all, women have to pay for contraceptives. Oral contraceptives cost €60-150 per year and intra-uterine devices (IUDs) about €80-150

when inserted (Koistinen 2008; Väestöliitto - Family Federation of Finland 2012; University Pharmacy 2014). These figures were roughly equal to about half a per cent of women's median annual income in the private sector in 2010 (Statistics Finland 2011). Condoms have low one-off costs. Although the cost of all types of contraceptives is relatively low, it may still pose an obstacle for someone at the lower end of the income scale. Another obstacle for some is lack of timely access to family planning services. Public clinics provide free or affordable services, but have long waiting times. Expensive private clinics have shorter waiting times and more often offer appointments with specialists. Private clinics are more often used by women with high socioeconomic status than those with a lower socioeconomic standing (Hemminki et al. 1997).

The results regarding the level of unintended pregnancy in Finland are inconsistent. This may be due to the very few studies on the topic having been conducted at different times, areas (Northern Europe versus Northern Finland), and including a different pool of pregnancies when the estimates were calculated (births and induced abortions versus only births) (Pouta et al. 2005; Rantakallio and Myhrman 1990; Singh, Sedgh, and Hussain 2010). Based on these unclear results, it is difficult to develop a thorough understanding of unintended pregnancies in Finland. Unfortunately, more recent studies of pregnancy intentions have not been conducted to the best of my knowledge. The results suggest that in 2008, 41 per cent of pregnancies were estimated to have been unintended in Northern Europe (Singh, Sedgh, and Hussain 2010). According to a study in Northern Finland, in 1985 one per cent of all births (i.e. excluding spontaneous and induced abortions) were unwanted and around seven per cent mistimed (Rantakallio and Myhrman 1990). Among all first pregnancies (births and induced abortions) of women born in 1966 in Northern Finland, 80 per cent were wanted, seven per cent mistimed, seven per cent unwanted and seven per cent refused to answer (Pouta et al. 2005).

1.5 Aim and structure of the thesis

The aim of this thesis is to study which socio-demographic characteristics are associated with a higher likelihood of abortion; to provide more precise estimates than previous studies of the socio-demographic characteristics associated with repeat abortion and how these patterns have changed over time; to examine socioeconomic pathways of women with different birth and abortion histories; and to show how the likelihood of abortion depends on duration and type of romantic relationships. Using reliable register-based data

from Finland, it is possible to study socioeconomic and demographic characteristics associated with the risk of abortion. To the best of my knowledge, previous studies on induced abortion have not been able to conduct such large-scale comparison with reliable individual-level data on abortion.

In addition to the Introduction (Chapter 1), Data and Methods (Chapter 2) and Conclusions (Chapter 7), the thesis consists of four substantive sub-studies. In the first, which I report in Chapter 3, I examined the socioeconomic gradient in the risk of first abortion and whether it changed over time using event-history analysis. I compared the role of education with occupational and labour market position in order to learn more about the possible mechanisms behind the socioeconomic patterns in the likelihood of abortion, and to examine which of these characteristics were the most important with regards to the likelihood of abortion. These results have been published in peer-reviewed journals: Väisänen, Heini (2015) 'The association between education and induced abortion for three cohorts of adults in Finland', *Population Studies,* 69(3): 373-388, and Väisänen, Heini (2015) 'Labour Force Participation and the Likelihood of Abortion in Finland over Three Birth Cohorts', *Finnish Yearbook of Population Research*, 50: 5-20.

In the second study, reported in Chapter 4, I examined whether there was an educational gradient in the likelihood of repeat abortion. The study provides more precise estimates than previous studies on the topic of the occurrence of repeat abortion and how its association with education and other socio-demographic characteristics have changed over time. The proportion of repeat abortion among all abortions in Finland has increased over time, indicating a need for a new family planning intervention. The study has been published in Väisänen, Heini (2015) 'Educational inequalities in repeat abortion: A longitudinal register study in Finland 1975-2010', *Journal of Biosocial Science*, doi:10.1017/S002193201600016X.

In the third study, reported in Chapter 5, I examined the association between the timing of abortion and union dissolution using multi-level, multi-process, event-history modelling. My aim was to test whether there were correlated unobserved woman-level characteristics associated with both having unstable relationships and being more likely to have an abortion, as well as with timing and number of births. The study is of publishable quality and I will submit it to a peer-reviewed journal in the near future.

Finally, I compared socioeconomic outcomes of women who had a birth, an abortion, or no pregnancy in adolescence. I report the study in Chapter 6. I used a recently developed method for studying mediation, the Karlson-Holm-Breen (KHB) method, to establish the extent to which teen abortion and teen birth mediate the relationship between parental and own socioeconomic position, and whether these pregnancy outcomes are associated with lower socioeconomic outcomes than expected based on parents' socioeconomic status. I have submitted the study to a peer-reviewed journal.

The versions of the sub-studies I included in the thesis may differ in some respects from the published or submitted papers. This is due to two reasons. First, I avoided repeating content that was similar across papers, such as data description or details of Finnish context which I outline in Chapters 1 and 2 of this thesis. Thus, I reduced the scope of these sections in the papers when I included them in the thesis. Second, in some cases I expanded on aspects that were important but had to be cut down from the published or submitted version due to word limits of the journal.

In the Conclusions section (Chapter 7), I sum up the findings of the thesis, discuss the limitations of it, and outline directions for policy and future research. Overall, I show in this thesis that there is a group of women with low education and probably less stable lives who do not benefit from contraceptive services as much as others. I also identify a need to collect survey data of fertility intentions and contraceptive use patterns in Finland. The current sources of such data are outdated, do not include the entire population of reproductive age, or both. This study is the first to show how patterns of socio-demographic determinants of abortion have changed over time using reliable, longitudinal cohort data. I also use methods which have not been used in studies of this topic previously: the KHB method and multi-level multi-process event-history modelling.

2. Data and methods

I start this chapter by outlining the most important characteristics of the administrative registers used to collect information for this study. Then I move on to describing the dataset I used. Finally, I describe the statistical methods I used to analyse these data and list a range of methods that were considered or tried, but did not turn out to be useful for my study.

2.1 Finnish register data

Ever since the year 1987, census information in Finland has been collected using administrative registers instead of a separate census collection effort. Register data are a rich resource for researchers and these data overcome many of the typical problems of longitudinal data, such as low response rates, attrition or recollection problems. Despite these advantages, register data are underused in sexual and reproductive health research, including abortion research (Gissler 2010).

Finnish register data are of exceptionally high quality for a study of induced abortion, as they include the personal identification number each permanent resident in Finland has, which enables linkage of data across registers of interest. This is not the case in Iceland, Sweden or Norway, where data collection is anonymous, for some or all abortions. Finland and Denmark are the only Nordic countries in which all abortion data can be linked to other registers (Gissler 2010). Given that studying abortion with representative data is difficult due to underreporting of abortion in surveys (Jones and Kost 2007), this resource should be used more.

The data for this study were collected from the Register of Induced Abortions, the Medical Birth Register, the Central Population Register and Statistics Finland's sources of socioeconomic information of the population. The institutional ethics review boards of Statistics Finland and the National Institute of Health and Welfare gave me their permissions[8] to use these data. I outline what these registers include and how the data were collected below.

Whenever a pregnancy is terminated in Finland, the physician inducing the abortion is required by law to register the event within one month to the *Register of Induced Abortions* maintained by the National Institute for Health and Welfare (THL)

[8] Permission numbers TK53-162-11 and THL/173/5.05.00/2011 respectively.

(THL 2015a). The register includes the personal identity number of the woman, the reason for abortion (see section 1.4.1 for more information on the accepted reasons for abortion in Finland) and other socio-demographic information, such as marital status, and socioeconomic position of the woman. According to an evaluation study conducted in the 1990s, more than 99 per cent of abortions found in hospital records were included in the register, making it an exceptionally reliable source of information (Gissler et al. 1996).

The Medical Birth Register is also maintained by the National Institute for Health and Welfare and it includes information on all live births as well as still births at or after 22 weeks of gestation or when the foetus weighted at least 500 grams (THL 2015b). The data included in this register are collected from maternity and neonatal wards for hospital births, which in Finland account for the vast majority of births (Gissler 2010). Information on the few births outside hospitals (only around one per cent of births are home births or births during transportation to hospital) are covered with separate data collection forms (Gissler 2010). The quality of this register is excellent and less than one per cent of deliveries are not included in it (Gissler et al. 2004; Gissler and Shelley 2002). As the Medical Birth Register has only existed since 1987, information of life births before that year was obtained from the Central Population Register, into which all live births in Finland are registered (Gissler 2010), for my dataset but after year 1987 the information came from the Medical Birth Register.

Data on a range of socio-demographic characteristics were obtained from other registers which include information on the entire population residing in Finland. Indicators of socioeconomic position, place of residence and relationship status (see chapter 2.1.2 for a more detailed description of the variables) were compiled by Statistics Finland from their own sources, such as Statistics Finland's Register of Completed Education and Degrees (Statistics Finland 2011) and from the Population Information System of Finland (Population Register Centre 2015).

2.1.1 Limitations of register data

Despite the advantages of register data, there are also limitations that are hard to overcome when this source is used for research purposes. As these data are collected for administrative rather than research purposes, the variables these registers include are often not ideal from a researcher's point of view. For instance, in a study like mine it would be useful to know what method of contraception the women used at each point in

time. Although some information regarding contraceptives that require a prescription, such as oral contraceptive pills, could be extracted from the National Prescription Register (Klaukka 2009), no information on condom or IUD use would be available from that, or any other source of register data. Moreover, even if a woman purchases oral contraceptives, the registers are unable to tell whether she actually takes the pill, or how consistent the use is. The Register of Induced Abortions includes self-reported information on contraception used at the time of conception that led to the pregnancy that is being terminated (Heino and Gissler 2012; Heino, Gissler, and Soimula 2011). Unfortunately, this information was not included in my dataset, but even if it were, the registers would not tell much about contraceptives other women use, or which contraceptives were used at times that did not precede an abortion.

Sometimes information that exists in registers cannot be included in a dataset for research purposes because of ethics regulations and legislation which protects the use of individual-level data in Finland. Ethics regulations and the Statistics Act, Personal Data Act and EU Regulation on Community Statistics limit the information that can be linked from different registers for study purposes (Statistics Finland 2013). For instance, the level of detail cannot be too specific, as no individual should be identifiable from the dataset. That is why in my data, for example, information on the place of residence was coded only at provincial level together with an indicator of whether the municipality each woman lives in is urban, semi-urban or rural (see chapter 2.1.2 below for more information) although the registers include the exact addresses of Finnish residents. In addition, data on partners' characteristics could not be included in my dataset.

Some variables are measured in a way that makes sense from an administrative point of view but is less ideal from a researcher's perspective. Income, for instance, only includes taxable income and thus excludes the types of income which are not taxed in Finland, such as those benefits and allowances which are not taxed (although the ones that are taxed are included in the annual income estimate), interest income, or scholarships (Official Statistics of Finland 2015a), although any type of resources may affect the choices individuals make regarding continuing a pregnancy to term.

2.1.2 Data of the study

Statistics Finland linked nationally representative data on three female birth cohorts (born in 1955–59, 1965–69 and 1975–79) from the above mentioned registers (see chapter 2.1)

using the unique identification numbers held in Finland for each permanent resident. They anonymised the data before handing it out to me.

Statistics Finland selected the data using a two-stage sampling design. First, an 80 per cent random sample of all the women in the above mentioned cohorts who had had at least one abortion within their fertile period (assumed to be ages 15-50) was selected (N=91,636). Women who had not reached age 50 were included in the sampling frame if they had had an abortion before year 2010, the end of the study period. All women from these cohorts who had ever had an abortion were not included in the data, because Statistics Finland does not allow the use of complete (sub-) populations on ethical grounds; the 80 per cent sample is the largest possible proportion of a population that can be used for research purposes. Second, a comparison group, twice the size of the abortion group, of women from the same cohorts who had not had an abortion were selected using random sampling (N=183,272). The sample was taken from women who had lived in Finland for at least a year (although most of these women had spent all their lives in Finland) within any of the following periods when detailed census information on the Finnish population was available: 1970–75, 1980–85 or 1987–2010 and had not had an abortion during their time in the country. In the statistical analysis, weights were used to control for this design. Overall the unweighted sample included almost half of the women of these three cohorts.

The dataset includes information on the following socio-demographic characteristics: month and year of induced abortions and live births; level of education; occupational group; place of residence; country of birth and native language; relationship status; annual taxable income; and labour force participation. Table 2.1 shows the variables of the dataset and the level of measurement of these variables. Below, I outline some important characteristics of the variables, which are not evident from the table or the text otherwise.

Parental socioeconomic status and women's own occupational status. In most analyses I present in this thesis, I merged some of the categories on these two variables and used a four-category version of it. Upper-level employees are those in managerial, professional and related occupations. Lower-level employees typically have administrative and clerical occupations. Manual workers often work in manufacturing or the distribution of goods and services. The 'other' category includes students, long-term unemployed, pensioners, those outside the workforce, and those who do not belong to

any of the other categories (Official Statistics of Finland 2013a). Women's own occupational group, and level of education were recorded at ages 20, 25 and 30 or the nearest year possible, as information on education and place of residence were recorded in the Population Register every five years (census years 1970, 1975 etc.) until year 1987, and until 2004 for occupational group, and then annually. Parental socioeconomic status was recorded when the women were 15 years old, or the nearest year possible before they turned 16 (see Figure 2.1 of timing of data collection).

Table 2.1. Variables of the dataset.

Variable	Other relevant information	Measurement level
Age		Year of birth of the woman.
Mortality		Year of death (if died before the end of the study period).
Socioeconomic background (parental SES)	*Measured based on the occupational status of the adult member of the household who had the highest status at the time of measurement.*	Self-employed, upper-level employee, lower-level employee, manual worker, student, farmer, and other.
Occupational status	*The status of the woman herself.*	Self-employed, upper-level employee, lower-level employee, manual worker, student, farmer, and other.
Level of education	*Highest completed level of education.*	Lower secondary level (i.e. the compulsory 9-10 years of schooling), upper secondary level, further education, lower or upper level tertiary education.
Labour force participation	*Included in registers annually since 1987; every five years before that.*	Employed, unemployed, student, other.
Individual income subject to state taxation[a]		Annual individual taxable income in Euros, top coded at €200,000
Relationship status	*Cohabitation included in registers since 1987.*	Married, cohabiting, unmarried, divorced, widowed
Place of residence	*Level of urbanisation*	Urban, semi-urban, rural.
	Location	Provinces 2009[b]
Ethnicity	*Mother tongue*	Domestic (i.e. Finnish or Swedish) or other.
	Country of birth	Finland or other.
	Time of immigration	Year of immigration (when first moved to Finland).
Live births		Month and year of each live birth.
Induced abortions		Month and year of each induced abortion, indication of abortion (social or medical).

(a) Information on income is compiled from three sources (see text). (b) Southern, Western or Eastern Finland, North (Oulu), Lapland and Aland (Western archipelago).

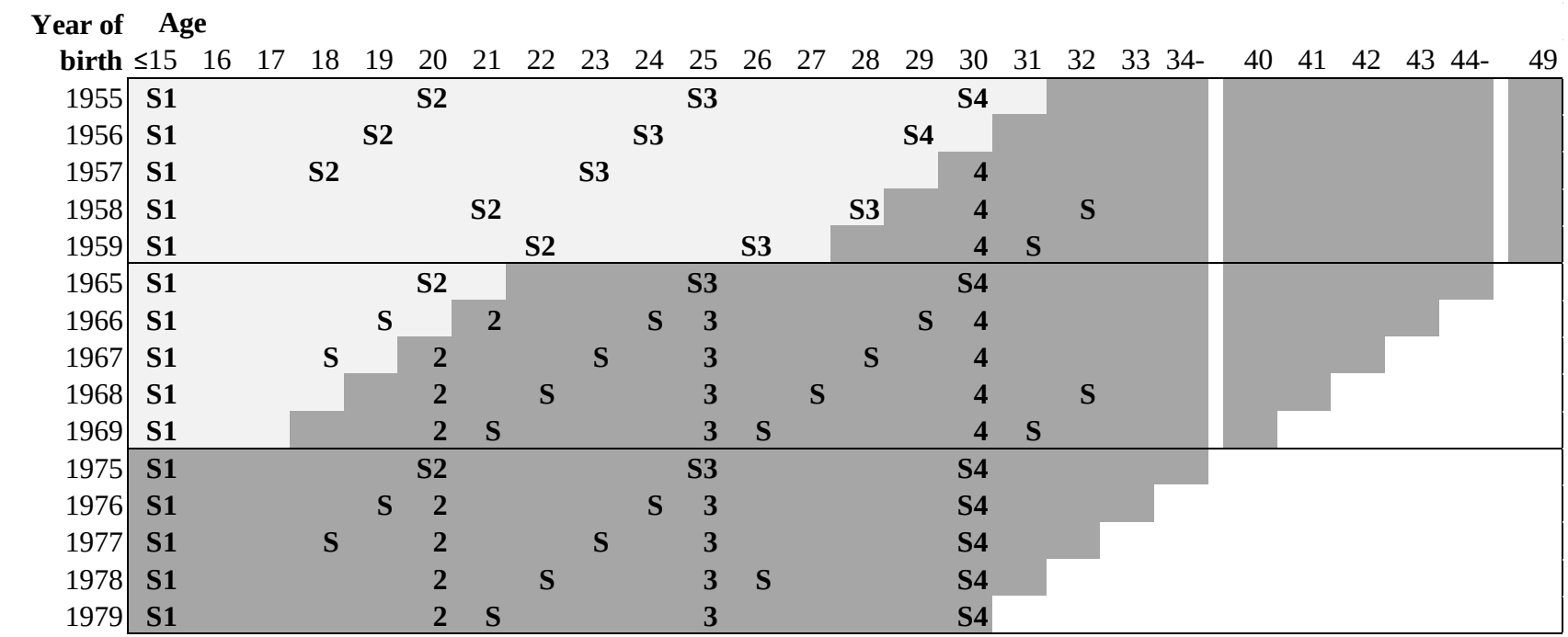


Figure 2.1. Measurement times of the variables of the study and follow-up time for each cohort.

Level of education. Statistics Finland does not give detailed information for research purposes about people with less than upper secondary education and codes their education status as 'missing'. In such cases I assumed that the woman had received basic education only. Basic education lasts on average nine to ten years, and upper secondary typically a further three years. 'Further education' means schooling after upper secondary education that has not led to an undergraduate or postgraduate (tertiary) degree. In some of the analyses I recoded education into three categories: low (only completed compulsory education), middle (upper-secondary or further education), and high (tertiary) education.

Individual income. The Finnish population registers collect information on income from three sources. First, information on wages and salaries subject to preliminary collection of taxes, wages and salaries from work, reimbursements of expenses by employer, holiday pay, wages and salaries to reservists, income from abroad taxed in Finland, value of purchased services in forestry, value of purchased services in partnerships, redemptions, service charges and other income subject to advance payment of taxes is collected. Second, entrepreneurial income consists of earned and capital income in agriculture and forestry, as well as trade and business. Third, information regarding other income subject to state taxation, such as pensions, unemployment benefits and other social security benefits that are subject to taxation are included (Statistics Finland 2015).

Relationship status. The Finnish population registers update information regarding marital status once a year (on the last day of the year), although it would be possible to also record the exact day of any changes. Cohabitation was not recorded at all before year 1987 but has since been recorded annually. Therefore, information on cohabitation is available since year 1987 in my dataset as well. Statistics Finland defines a cohabiting couple as "two spouseless [unmarried] adults of different sex aged 18 and over and occupying the same dwelling on a permanent basis, provided their age difference is less than 16 years and they are not siblings" or as a man and a woman living together with a common child (Official Statistics of Finland 2015b). Statistics Finland's classification of marital status is based on the official marital status, regardless of who the people are living with. Thus, I cannot differentiate between those who are married and living with their spouse from separated women.

Place of residence. Place of residence includes information on which of the six provinces the woman lives in (Southern, Western or Eastern Finland, North (Oulu), Lapland, and Aland (Western archipelago)) and whether the municipality she lives in is urban (that is, a municipality in which at least 90 per cent of the population lives in urban settlements, or in which the population of the largest urban settlement is at least 15,000 people), semi-urban (between 60 and 90 per cent of the population lives in urban settlements, and the population of the largest urban settlement is between 4,000 and 15,000 people), or rural (the remaining municipalities) (Official Statistics of Finland 2009). This information was recorded at ages 15, 20, 25 and 30 or the nearest year possible before year 1987. I assumed a woman had emigrated from Finland if there was information in the registers about her initially, but none after a certain point in time, but no year of death was recorded.

Births and abortions. Information on stillbirths and spontaneous abortions (miscarriages) were excluded from my dataset. The former are registered systematically, but the latter only if the spontaneous abortion requires treatment in a hospital (Vikat, Kosunen, and Rimpela 2002). Year and month of induced abortions and live births were included in my dataset. In these data, the indication of abortion could not be obtained with as much detail as is included in the population registers due to ethics regulations and personal data protection. Thus, an abortion due to a medical problem of the foetus or one of the parents was grouped into one category of 'medical' indication (indications number 5 to 7 in section 1.4.1; also see Knudsen et al. 2003). The indication was classified as 'social' if the abortion was due to considerable strain caused by living or other condition, age of 16 or less or 40 or more, or due to the woman already having had at least four children (indications numbers 1-4 in section 1.4.1; also see Knudsen et al. 2003). The rare 'ethical' indication of abortion in cases of rape and incest (indication 8 in section 1.4.1; also see Knudsen et al. 2003) was grouped together with social indication in order to differentiate between unwanted pregnancies (social and ethical reasons) and pregnancies that were probably wanted, but terminated due to medical problems of the foetus or one of the parents. Classifying terminated pregnancies into wanted and unwanted in this way is problematic, as women's pregnancy intentions and the reasons for abortions are more complex than that (Bankole, Singh, and Haas 1998; Coast, Norris, and Freeman 2015; Finer et al. 2005), but as data for this study come from administrative registers no other information of women's reasons for abortion was available.

2.2 Description of the methods used in this study

Many of the sub-studies in the thesis use discrete-time event-history analysis to analyse the data. These types of models are useful, when the interest of the study is in time-to-event, or in other words, when it is important to estimate how the likelihood of the outcome of interest varies with duration. In some of the studies, the duration of interest is the woman's age, whereas in others it may be time since last birth or abortion, or since the start of a relationship, or a combination of these. The last sub-study examines socioeconomic pathways from parental socioeconomic status to that of the women when they are adults and how these pathways were mediated by teen births and abortions, and thus uses statistical techniques designed to measure mediation.

2.2.1 Discrete-time event-history analyses

Discrete-time event-history models typically are logistic regression models with analysis time included as a dummy-variable. I chose a discrete-time approach, as even the shortest measured time intervals in the study were one month long. Moreover, as most explanatory variables were measured once a year or only every five years, including analysis time as a continuous variable with smaller increments than that would have had a minimal impact on the results of the study. The benefits of discrete-time models also include straightforward use of time varying covariates (Steele, Goldstein, and Browne 2004). The implicit assumption that the hazard function and covariate values are constant within each one-year age interval leads to minimal loss of information compared to continuous-time models such as Cox regression (Steele et al. 2005).

These models can be expressed as follows:

$$\log\left(\frac{p_{ti}}{1-p_{ti}}\right) = \alpha \boldsymbol{D}_{ti} + \beta \boldsymbol{x}_{ti} \qquad (2.1)$$

Where p is probability of event during interval t for individual i, $\alpha \boldsymbol{D}_{ti}$ is the baseline logit hazard and $\boldsymbol{D}_{ti}$ is a vector of functions of time t. The baseline logit hazard function can be specified as a polynomial function, or as a categorical variable, which is also known as a step function. The vector of explanatory variables is represented by $\boldsymbol{x}_{ti}$ with coefficients β (Steele 2005).

The appropriate specification of the baseline hazard depends on the research question and the relationship between time and the outcome of interest. A step function

poses fewer restrictions on the shape of the baseline hazard than a polynomial function, but is less parsimonious. Unless an interaction effect between the time variable and an explanatory variable is specified, the model assumes that the effects of the explanatory variable are the same for all time points. In other words, the hazards are assumed to be proportional. If such an interaction effect is statistically significant, the hazards are non-proportional, or in other words, the effect of the explanatory variable in question varies in time (Steele 2005).

To illustrate the results of the event-history analyses, I calculated fitted probabilities using average marginal effects at representative values. This entailed treating all respondents as though they had a characteristic of interest, say had only completed basic education, leaving the values of all other variables as observed when calculating the probability of the outcome. The same calculation was conducted for each of the levels of education. The average of these marginal effects becomes the probability of having an abortion in each education group (Williams 2012) and therefore interpreted as population-level averages.

2.2.2 Multi-level multi-process event-history modelling

I used multi-process models, when estimating risks of highly correlated events, such as abortion and union dissolution. These models were first introduced by Lillard (1993). The advantages of these models include ability to jointly estimate the hazards of different events while allowing for correlation between unmeasured individual-level determinants of those events, which are represented by random effects. If the outcome of interest can happen more than once to the same individual, these events are nested within individuals and therefore such correlation needs to be allowed for (Steele et al. 2005).

These models can be expressed in the following way:

$$\log\left(\frac{p_{tij}^{y}}{1-p_{tij}^{y}}\right) = \boldsymbol{\alpha^{y} D}_{tij} + \boldsymbol{\beta}^{y}\boldsymbol{x}_{tij}^{y} + \boldsymbol{\gamma}^{y}\boldsymbol{z}_{tij} + u_{i}^{y} \qquad (2.2)$$

$$\log\left(\frac{p_{tij}^{z}}{1-p_{tij}^{z}}\right) = \boldsymbol{\alpha^{z} D}_{tij} + \boldsymbol{\beta}^{z}\boldsymbol{x}_{tij}^{z} + \boldsymbol{\gamma}^{z}\boldsymbol{y}_{tij} + u_{i}^{z} \qquad (2.3)$$

Where p_{tij} is the probability of the event of interest during a discrete-time interval t for individual i, $\boldsymbol{\alpha^{y} D}_{tij}$ and $\boldsymbol{\alpha^{z} D}_{tij}$ are the baseline logit hazard functions (as in single-level discrete-time event-history models, see section 2.2.1). Unobserved time-invariant

woman-specific factors are represented by random effects u_i^y and u_i^z in order to allow for selection on time-invariant individual-level characteristics. These effects are typically assumed to be normally distributed with mean zero and they are allowed to correlate freely across equations. The potentially endogenous time-varying variables are represented by $\boldsymbol{z}_{tij}$ and $\boldsymbol{y}_{tij}$ with coefficient vectors $\boldsymbol{\gamma}^y$ and $\boldsymbol{\gamma}^z$, respectively. The exogenous covariates are represented by $\boldsymbol{x}_{tij}^y$ and $\boldsymbol{x}_{tij}^z$ with coefficient vectors $\boldsymbol{\beta}^y$ and $\boldsymbol{\beta}^z$, respectively. These covariates are assumed to be uncorrelated with the woman-level random effects u_i^y and u_i^z (Steele et al. 2005; Steele, Goldstein, and Browne 2004).

I used Bayesian estimation using the Markov Chain Monte Carlo (MCMC) method to estimate the multi-process models (Browne 2009), because it has been shown that the alternative quasi-likelihood methods are often biased when the response variable is binary (Rodriguez and Goldman 1995), like my response variables were. The bias is typically more severe if the cluster size is small, there are few higher-level units, or if the proportion experiencing the event is extremely high or low (Browne 2015; Rodriguez and Goldman 1995).

MCMC is a simulation-based procedure. It is typically run for thousands of iterations and at each iteration an estimate of the distribution of each parameter of interest is produced based on the data (Browne 2015). Each time the estimates from the last iteration are used to produce the new estimates, that is, the parameters are updated by making a random draw from their conditional posterior distributions (given the data) (Browne 2015; Gilks, Richardson, and Spiegelhalter 1996; Steele, Goldstein, and Browne 2004). The new estimate only depends on the current state of the chain not the history of it. Such a chain of estimates is called a *Markov Chain* (for more information see Gilks, Richardson, and Spiegelhalter 1996). In order to produce the first round of estimates, prior information of each parameter is needed. Typically such information is not known. In my study, I used the default values of MLwiN (the software I used), which are designed to inform the algorithm of this lack of knowledge (for more information on the default values in MLwiN see Browne 2015, pp. 4–5). After the chain is run for a long enough time, it will 'forget' its starting position and starts taking samples of the posterior distribution of interest. These initial iterations are called the *burn-in* period (Gilks, Richardson, and Spiegelhalter 1996). Using iterative generalised least squares (IGLS) results as starting values reduces the number of iterations needed before the chain

converges (Browne 2015). The estimates MCMC produces are the means and standard deviations of the chains after the burn-in period is omitted from the chain .

Inference in Bayesian models is a complicated matter (see e.g. Pereira, Stern, and Wechsler 2008). One possibility is to use ‘credible intervals’: a 95 per cent credible interval, for instance, corresponds to the 2.5 percent and 97.5 per cent points of the distribution of the MCMC samples and it shows that given the data, the ‘true’ parameter value lies within the interval with 95 per cent probability. If zero was included in such an interval of a parameter estimate, it would not be significantly different from zero (see e.g. Gilks, Richardson, and Spiegelhalter 1996; Steele, Kallis, and Joshi 2006). The fit of different models can be compared using Bayesian deviance information criterion (DIC), which measures the model fit by ‘deviance’ but penalises for model complexity. Differences in of more than 3–7 between the DIC values are considered to signify less support for the model with the higher value according to the (somewhat controversial) article by Spiegelhalter and colleagues (2002).

After I had conducted the models using the MCMC method, I used model diagnostics to assess whether the parameters have reached the desired equilibrium distribution or whether a larger number of simulations should be conducted. One of the tools, effective sample size (ESS), shows how many independent samples for each parameter the model produced. The models can be made more efficient by using orthogonal fixed effect vectors, or parameter expansion, or both. The orthogonal fixed effect vectors reparameterize the model making the MCMC chains less auto-correlated and thus the model can be run for fewer iterations to achieve the same ESS (Browne et al. 2009). Parameter expansion increases ESS in cases where clustering is weak and the variance of the random effect is close to zero (Browne et al. 2009).

Other diagnostics I considered, included the trace of the parameters (which should not have a trend), the Kernel density plot (which estimates the posterior distribution and should be normally distributed), the autocorrelation plot (ACF) (which gives the correlation between the series lagged with itself; if the sampling procedure is efficient, the lags are relatively independent), the partial autocorrelation plot (PACF) (which shows the partial correlation between the original data and that of displaced by *k* number of lags; ideally the lag should be close to zero after lag 1), and the Monte Carlo standard error of the posterior estimate (MCSE) (which indicates the accuracy of the mean estimate and

suggests how long the MCMC chain should be run in order to get accurate estimates) (Browne 2015). These parameter-level diagnostics may vary depending on parameter.

Figure 2.2 gives an example of how MCMC diagnostics graphs may look. It is based on a single-equation multi-level discrete-time event-history model estimating the likelihood of giving birth extracted from preliminary analyses I conducted for the study in Chapter 5. The graph in the upper left hand corner is the trace of the parameter (the woman-level random effect in this case, see Chapter 5 for more information), and the other graphs represent the diagnostic shown in the y-axis title. For this random parameter the trace of the parameter and the Kernel density plot look acceptable. However, ACF and PACF suggest that the parameter is highly auto-correlated and thus converges slowly. As ACF does not fade to zero, equilibrium may have not yet been reached and thus I had to consider increasing the number of simulations. The MCSE measure suggested that some extra precision may have been reached with up to 500,000 iterations of the chain (the model was iterated 100,000 times).

In addition to the graphical diagnostics tools described above, there are numerical diagnostic tools in addition to ESS. The Raftery-Lewis diagnostics gives an estimate of the appropriate length of the chain. The Brooks-Draper diagnostics also estimates the appropriate length of the chain, but uses information on the mean of the distribution unlike Raftery-Lewis, which is based on quantiles of the distribution, and thus these diagnostics may disagree on the appropriate chain length (Browne 2015). Returning to our example described in Figure 2.2 and in the paragraph above, the ESS for the woman-level random effect was 1,088, thus indicating that the inferences were based on to about a thousand independent samples. The Raftery-Lewis diagnostic suggested that up to 28,352 simulations are needed (which was exceeded as the model was iterated 100,000 times), whereas according to the Brooks-Draper estimate 2,402 iterations would have been enough. Thus, I did not increase the number of iterations, as these models are slow to converge and most of the diagnostics showed satisfactory results.

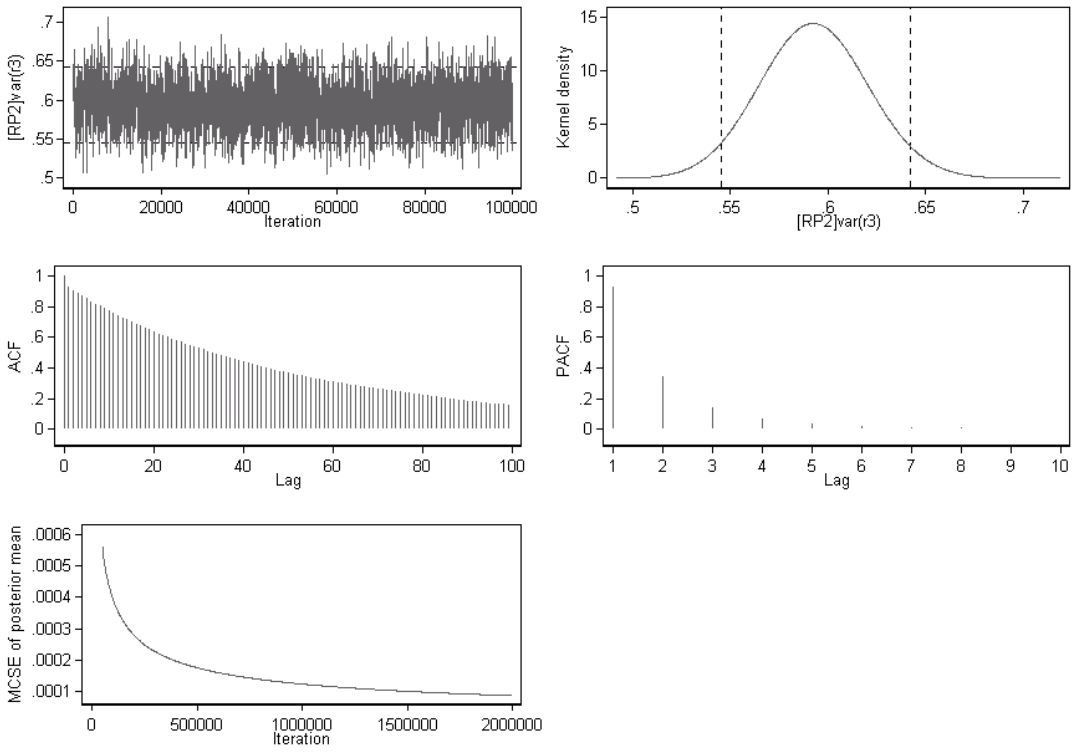


Figure 2.2. An example of MCMC diagnostics graphs.

2.2.3 Karlson-Holm-Breen method of mediation

An association between an explanatory variable and an outcome of interest through a third variable is called *mediation* or an *indirect effect* (see e.g. Richiardi, Bellocco, and Zugna 2013). Linear regression models can be used to study mediation in a straightforward way by comparing the estimates of two nested models: one where the main explanatory variable is regressed against the outcome and another one where all mediators have been added. The two models, the full model (including direct and indirect effects) and the reduced model (including only direct effects), may be expressed as follows:

$$Y = \alpha_F + \beta_F X + \gamma_F Z + \epsilon \qquad (2.4)$$

$$Y = \alpha_R + \beta_R X + \epsilon \qquad (2.5)$$

Where (2.4) is the full and (2.5) the reduced model, Z is the mediator, and X the explanatory variable of interest (that is 'the key variable') and ϵ is an error term. The indirect effect (β_I) is the difference between the total (β_R) and the direct (β_F) effect (Kohler, Karlson, and Holm 2011). 'Direct effect' is the part of the association from the explanatory variable to the outcome that does not travel through the third (i.e. the mediator) variable.

However, if the outcome of interest needs to be analysed using a model from the generalised linear models' family, it is not possible to compare estimates between two nested models in the same straightforward way. This is because the estimates do not only change due to the mediators being added to the model, but also because of rescaling. Rescaling happens as these models do not estimate the error variance and the regression coefficients separately. Instead, the 'true' coefficient estimates are divided by a scale parameter, which is a function of the error standard deviation, which in turn differs between models. Whenever a coefficient that has an effect on the outcome is added to the model, the residual standard deviation decreases, as the model with more coefficients explains more of the variation of the outcome than the model with fewer coefficients. Therefore, the estimates of the coefficients that were already in the model before the new coefficient was added may change even if there is no mediation (Breen, Karlson, and Holm 2013).

Karlson, Holm, and Breen developed a method called KHB (after the names of the developers) to correct for the rescaling to make two nested nonlinear models comparable (Breen, Karlson, and Holm 2013; Karlson and Holm 2011; Kohler, Karlson, and Holm 2011). There are other methods developed for this purpose too, such as a decomposition method suggested by Buis (2010), but KHB has been shown to perform equally well or better than the Buis' method (Karlson and Holm 2011). Therefore, I chose to use KHB in the study reported in Chapter 6.

When mediation is studied using a logistic regression model, KHB extracts the information of the mediator variable Z not contained by the explanatory variable X by calculating the residuals of a linear regression of Z on X. These residuals R are then used as a covariate in the reduced model (Kohler, Karlson, and Holm 2011):

$$Y^* = \tilde{\alpha}_R + \tilde{\beta}_R X + \tilde{\gamma}_R R + \epsilon \qquad (2.6)$$

Where Y^* is a continuous latent variable underlying the observed binary variable, and the only difference between R and Z is the part of Z correlated with X. The indirect effect can then be calculated without the problem of rescaling, since the residuals of the full model and the restricted model estimated with R have the same standard deviation (Kohler, Karlson, and Holm 2011).

The KHB method allows studying multiple mediators at the same time, and including control variables which are not on the indirect or direct pathway of the model.

KHB also estimates whether the mediating effects are statistically significant (see Breen, Karlson, and Holm 2013; Kohler, Karlson, and Holm 2011 for more information). The method produces an estimate of the proportion of the total effect mediated by Z. This estimate is called *confounding percentage* (Breen, Karlson, and Holm 2013; Karlson and Holm 2011; Kohler, Karlson, and Holm 2011). It can be used to compare mediation patterns between groups, since results are scale free due to the scaling factor cancelling out when it is calculated (Breen, Karlson, and Holm 2013).

2.2.4 Alternative methods

I explored many methodological strategies along the way other than the ones reported here, but abandoned them. Namely these included causal inference methods, which I considered for a study comparing the socio-demographic outcomes of women with different birth and abortion histories (see Chapter 6). I describe below how these types of models were not appropriate due to limitations of the available data.

One of the quasi-experimental models I considered was propensity score matching. Ideally, it would have allowed matching otherwise similar women with different pregnancy histories, such as different teen pregnancy experiences, and analysing to what extent the direction of their life course changed as a result of these pregnancies. However, the method assumes that all the variables that can influence the probability of 'treatment' (such as becoming a teen mother) are included in the model (Caliendo and Kopeinig 2008). This is not the case in my data, where characteristics such as pregnancy intentions, attitudes, and religiosity, are not known although they are associated with the likelihood of an abortion as well as timing of births and family size.

Other types of causal inference methods were excluded due to similar problems arising from the limitations of the data. For instance, some studies have used instrumental variable methods to examine the association between teen pregnancies and later socioeconomic outcomes (e.g. Chevalier and Viitanen 2003; Hotz, McElroy, and Sanders 2005). Instruments are variables associated with the endogenous explanatory variable but not with the outcome. For instance, in a study of how teen births are associated with education, it could be the proximity of the nearest family planning clinic. Miscarriages are often used as instrumental variables in studies of births and abortions, as it is assumed that they are distributed randomly among pregnant women (see e.g. Hotz, McElroy, and Sanders 2005). However, miscarriages are not ideal instruments, as induced abortions

reduce the risk of miscarriage among pregnant adolescent women (Ashcraft, Fernández-Val, and Lang 2013) and pregnancy terminations among pregnant adolescents tend to concentrate among those with higher socioeconomic background (Väisänen and Murphy 2014), making the event dependent on socioeconomic characteristics. It also restricts analyses to only include women who have been pregnant. In any case, information on miscarriages was not included in my dataset, so I had to rule out using this instrumental variable. Other possible instruments include, for instance, age at menarche, access to family planning services, abortion rates in the area where the women live or other regional variables. However, as I do not have any information on age at menarche, or detailed information on where these women live (see chapter 2.1.2 for more information), I could not use these types of instruments.

Not being able to use causal inference methods does not compromise the objectives of this thesis, as it was not a priority of this study to explore causal relationships. Some of the most useful characteristics of register data include the reliability of the information, the longitudinal nature of the data, and a large sample size. Some of the most severe limitations, as outlined in chapter 2.1.1, include the small number of variables available for analysis. These types of data are best used in a study of detailed description of a phenomenon, which would otherwise be hard to measure due to bias in data collected using surveys and interviews. Abortion is an example of that kind of a phenomenon.

3. Socioeconomic position and the likelihood of abortion

3.1 The association between socioeconomic status and induced abortion for three cohorts of adults in Finland[9]

Abstract

This paper explores whether the likelihood of abortion by education changed over time in Finland, where comprehensive family planning services and sex education have been available since the early 1970s. This subject has not previously been studied longitudinally with comprehensive and reliable data. A unique longitudinal set of register data of more than 260,000 women aged 20-49 born in 1955-59, 1965-69 and 1975-79 was analysed, using descriptive statistics, concentration curves, and discrete-time event-history models. Women with basic education had a higher likelihood of abortion than others and the association grew stronger for later cohorts. Selection into education may explain this phenomenon: although it was fairly common to have only basic education in the 1955-59 cohort, it became increasingly unusual over time. Thus even though family planning services were easily available, socioeconomic differences in the likelihood of abortion remained.

Keywords: induced abortion; register data; Finland; reproductive health; event-history analysis

[9] The results presented in this section have been published as Väisänen, Heini (2015) "The association between education and induced abortion for three cohorts of adults in Finland." *Population Studies* 69(3), 373-388.

3.1.1 Introduction

In many countries women in less advantaged socioeconomic positions have more abortions than other women (Hansen et al. 2009; Jones, Darroch, and Henshaw 2002; Rasch et al. 2007; Regushevskaya et al. 2009). High prevalence of contraceptive use has been shown to be associated with a reduction in the number of abortions per woman (Bongaarts and Westoff 2000) and health-care costs (Cleland et al. 2011; Frost et al. 2014; Frost, Finer, and Tapales 2008), but studies have not examined whether universal access to family planning services reduces socioeconomic differences in the likelihood of abortion.

The aim of the study reported in this paper was to investigate differences by education in the likelihood of abortion in Finland, a country where comprehensive family planning services and sex education have been available since the early 1970s (Kontula 2010; Kosunen 2000), and where parents are offered generous financial and other help to enable them to ensure that at least the essential needs of their children are met (Haataja 2006; Vikat 2004). The study used a unique and nationally representative longitudinal dataset based on administrative registers that made it possible to investigate both the relationship of education to abortion and—something that to the best of my knowledge other studies in Finland or elsewhere have been unable to investigate—whether the association changed over time. The nature of the dataset meant that the study did not suffer from the drop-outs and non-responses common in panel studies or the common problems of underreporting of abortions in surveys (Jones and Kost 2007).

Previous studies in Finland differed from the one reported here in one or more of the following respects: they were based on cross-sectional surveys (Regushevskaya et al. 2009); they studied women who had had at least one abortion thus ignoring those who had never experienced one (Heikinheimo, Gissler, and Suhonen 2008, 2009; Niinimäki et al. 2009; Väisänen and Jokela 2010); or they did not investigate the women's level of education (Hemminki et al. 2008; Sydsjö, Josefsson, and Sydsjö 2009; Vikat, Kosunen, and Rimpela 2002). Because most other countries in which studies have been undertaken do not have register data on abortions (Gissler 2010), their studies have been based on surveys, which often suffer from underreporting of abortions (Jones and Kost 2007).

Socioeconomic status and pathways to abortion

Previous studies in the United States and Europe (including Finland) have shown that the likelihood of having an abortion is positively associated with the following characteristics: low socioeconomic status (SES) (Klemetti et al. 2012; Rasch et al. 2007; Väisänen and Jokela 2010); low education and income (Jones, Darroch, and Henshaw 2002; Regushevskaya et al. 2009); young age (Jones, Darroch, and Henshaw 2002; Klemetti et al. 2012; Knudsen et al. 2003; Niinimäki et al. 2009; Rasch et al. 2007); being single, having relationship problems, or previous births (Hansen et al. 2009; Jones, Darroch, and Henshaw 2002; Klemetti et al. 2012; Rasch et al. 2007; Regushevskaya et al. 2009); and previous abortions (Hansen et al. 2009; Niinimäki et al. 2009).

A higher likelihood of experiencing an unintended pregnancy is associated with a higher likelihood of an abortion. Unintended pregnancies may be unwanted (not wanted at all) or mistimed (preferred later) (Santelli et al. 2009; Trussell, Vaughan, and Stanford 1999). Pregnancies may be unintended for one or more of the following reasons: because a woman does not want to have any (more) children, because she wants to postpone childbearing, because she does not want to have children with her current partner, or because she perceives her socioeconomic situation as unfavourable for childbearing

Low education and income have been associated with a higher likelihood of unintended pregnancies in the United States (Finer and Zolna 2011), the United Kingdom (Wellings et al. 2013) and Spain (Font-Ribera et al. 2007). That association was not found in a study in the Netherlands. Although highly educated women there were overall found less likely to become pregnant, there was no association between education and the proportion of unintended pregnancies among all pregnancies (Levels et al. 2010).

Contraceptive failure or lack of contraceptive use when there is no intention to become pregnant, may lead to an unintended pregnancy. Studies have found that higher SES is associated with more effective contraceptive use and more satisfaction with family planning services in the United States (Frost, Singh, and Finer 2007; Kost et al. 2008; Ranjit et al. 2001) and Finland (Hemminki et al. 1997; Kosunen et al. 2004).

The aim of the study

In the study reported here, I focused on the likelihood of first abortion by level of education. The emphasis is in women who chose to terminate pregnancy on social grounds, which are the grounds cited for more than 90 per cent of all abortions in Finland

(Heino, Gissler, and Soimula 2011). The specific research questions were as follows. How strong is the association between education and the likelihood of abortion? Has the strength of the association changed over time? Has the increasing level of education in the population been associated with changes in abortion rates? The results of previous studies led me to expect low education to increase the likelihood of abortion (Jones, Darroch, and Henshaw 2002; Regushevskaya et al. 2009), but offered no guidance on whether better information on contraceptive use and access to family planning services and sex education were likely to have decreased differences by education in the likelihood of abortion over time. It seemed possible that as more women had better information on contraceptive use and access to family planning services, differences by education would decrease. On the other hand, if it was the more educated women who had taken advantage of easier access to these services, the differences in the likelihood of abortion by education may would have increased. Other studies have shown that it is typically people of higher socioeconomic status who are the first to take advantage of new public services, and thus benefit disproportionally from them (Hemminki et al. 1997; Saurina, Vall-llosera, and Saez 2012). As a robustness check, the analyses were also conducted using occupational category as the main explanatory variable.

The majority of abortions in Finland are first abortions (63 to 73 per cent of all abortions in the period between 1987 and 2010 (Heino, Gissler, and Soimula 2011)), and this was the category chosen for the study. The determinants of first abortions may differ from those that explain higher-order abortions. For instance, it has been reported that women seeking their second or higher-order abortion have lower education than those seeking first abortions (Jones et al. 2006; Makenzius et al. 2011) and are more likely to use barrier methods and oral contraceptives than long-acting reversible methods (Heikinheimo, Gissler, and Suhonen 2008; Jones et al. 2006; Niinimäki et al. 2009; Osler, David, and Morgall 1997). The study was restricted to women aged 20 to ensure that all the subjects of the study were old enough to have completed at least basic education. Many had completed upper secondary education, which is typically completed by age 20 in Finland, but enough had not done so to allow a comparison between upper and lower secondary groups. More clear-cut findings were possible for women aged over 20 because many in their early 20s had not yet finished their education, while women aged 25 or more were likely to have achieved the highest level of education they would attain. Moreover, the circumstances in which adult women choose to terminate a pregnancy

often differ from those in which teenagers do so. The costs of childbearing for the latter group are more severe because they may not have completed their education or formed stable partnerships or had time to accumulate resources (Becker 1991; Hansen et al. 2009; Kreyenfeld 2010; Oppenheimer 1994; Väisänen and Murphy 2014). Another reason for not studying the association between family SES and the likelihood of abortion among Finnish teenagers was that this had already been the subject of a study by Väisänen and Murphy (2014).

3.1.2 Data

The dataset used in this study has been described in section *2.1.2 Data of the Study*.

Because this was a study of adult women, those in the original sample who had died (N=621) or emigrated (N=5,233) before age 20 were not included. Most women entered the study when they reached age 20, but the 13,308 women who immigrated when aged 21 or older were included in the sample on their year of arrival in Finland. Overall 269,054 women were included in the study. The number changed over time owing to mortality and migration. There were 91,636 first abortions in the data, 65,384 of which took place at age 20 or later. Of these abortions, 62 were recorded as having taken place before the woman's recorded year of immigration and were therefore excluded from the analyses. Of the remaining abortions, 58,183 were conducted for social reasons, 6,018 for medical reasons, and 1,121 for reasons that were not recorded.

The following information was used in this study: induced abortions; live births; education (basic, upper secondary, further, undergraduate, or postgraduate); occupational group; place of residence; immigration status; and relationship status. All except immigration status were time varying (see Figure 2.1 for more information on measurement times and section 2.1.2 of this thesis for more information on how the variables were measured).

3.1.3 Methods and analytical strategy

The analysis proceeded as follows. I calculated the number of first abortions by reason (social or medical) per 1000 women by age, education (and occupational group as a robustness check), and cohort to see whether the numbers differed by these characteristics. The denominators included women who had already had an abortion,

although they were no longer at risk of having their first abortion, since these rates have conventionally been based on the whole population.

In order to assess whether the differences in abortion by education changed over time, I calculated concentration curves of education and the incidence of abortion using aggregate data. I plotted weighted cumulative percentage of abortion against cumulative level of education beginning from the lowest level (see e.g. Chen and Roy 2009; Erreygers and Van Ourti 2011; Konings et al. 2009). With this method, if abortions are equally distributed among education groups, the concentration curve coincides with the 45° 'equality line'. The further the concentration curve is above the equality line, the more common are abortions among the less than the more educated women (Chen and Roy 2009; Erreygers and Van Ourti 2011). Since level of education was an ordinal variable with five categories unequally distributed within the population, I had to assume that the distribution of abortion was constant within education groups (Konings et al. 2009), although these groups may be heterogeneous. Since the data included 80 per cent of women who ever had an abortion, the estimates were precise and it was unnecessary to provide confidence intervals.

In order to explore whether changes in abortion rates across cohorts were attributable to the changing composition of the population by education, I calculated standardized cohort abortion rates by age-group (20–24, 25–29, 30–34) and cohort, using the distribution by education of the 1950s cohort as standard. This shows the expected number of abortions per 1000 women for the other two cohorts had their distribution by education been the same as that of the 1950s cohort (see e.g. Hinde 1998). Comparing the standardized estimates with those observed reveals whether abortion levels would have been different had the composition of the population by education not changed, all else being equal.

Discrete-time event-history analyses were used to determine whether the patterns by education held after controlling for other factors known to be associated with the likelihood of abortion (see section 2.2.1 for more information on these methods). These control variables included the following: parity, months since last birth and its quadratic term, indicator of being childless (0 for women with no live births recorded, 1 for others), place of residence, occupational group, relationship status, and immigration status (Hansen et al. 2009; Jones, Darroch, and Henshaw 2002; Rasch et al. 2007;

Regushevskaya et al. 2009; Vikat, Kosunen, and Rimpela 2002). The results are also shown by occupational group.

The duration of time of interest in the event-history models was age measured in year-wide increments and centred around age 20, the start of the study period. The women were followed until their first abortion for social reasons or censored at whichever of the following occurred first: end of year 2010, age at emigration, death, age 50, or an abortion for either a medical reason or without a recorded reason. In order to allow for differences in the estimates by age and cohort, the analyses were run separately for the three cohorts and 5-year age-groups (20-24, 25-29, 30-34, 35+). To test the statistical significance of the interactions I conducted a model that included all cohorts, and in which education was interacted with cohorts and age-groups.

To show the results of the event-history analyses, I calculated fitted probabilities of abortion by age-group and level of education, using average marginal effects at representative values (Williams 2012). I presented the results as the predicted number of abortions per 1000 women, with 95 per cent confidence intervals.

All of these estimates highlighted a slightly different aspect of the association between education and abortion. The fact that they all pointed to the same interpretation of the association between level of education and abortion was a good indication of the robustness of the results. Stata 13 was used for all analyses except the concentration curves, which were calculated using R 2.15.

3.1.4 Results: education and abortion

As Table 3.1 shows, half of the women in the 1950s cohort had only basic education at age 20, but the proportions had fallen to around a quarter in the 1960s and 1970s cohorts. By age 30, a quarter of women still remained in this category in the earliest cohort, but only 11 to 15 per cent in the other two cohorts. Also, the proportion of women with an undergraduate or postgraduate degree by age 30 was higher for the 1970s cohort (42 per cent) than in the other cohorts (10 per cent and 15 per cent in 1950s and 1960s cohorts, respectively).

Table 3.1. Women's level of education at ages 20, 25 and 30 by cohort in Finland, weighted % and unweighted N

	1955-59			1965-69			1975-79		
Education	**20**[1]	**25**[1]	**30**[1]	**20**[1]	**25**	**30**	**20**	**25**	**30**
Basic	47.9	27.7	24.1	23.2	16.8	15.2	18.2	12.5	11.2
Upper Sec.	47.3	47.7	39.1	75.2	69.7	48.8	54.1	53.7	38.7
Further	4.8	17.1	26.5	1.6	7.5	20.7	27.7	10.4	8.5
UG	0.0	5.4	4.6	0.0	2.6	4.3	0.0	17.6	24.8
PG	0.0	2.1	5.7	0.0	3.3	11.0	0.0	5.9	16.8
Total = 100% N	102,014	101,090	100,442	95,540	96,102	96,439	58,173	58,746	59,149

[1]Measured at age 20, 25, or 30 or the nearest year possible (see text).
Upper Sec.= upper secondary education; UG = undergraduate education; PG = postgraduate education.

There were relatively more abortions—2 to 5 per 1000 women—for medical reasons in the 1950s cohort among women younger than 27 years than in the other two cohorts, in which the proportion was less than one. This might be because legislation permitting abortion for social reasons came into force in June 1970, and it took time for the practice of recording this as the reason to become established (Figure 3.1).

Figure 3.2 shows that the first-abortion rate varies across education groups in all cohorts. Overall, differentials were largest for young women but decreased with age. Women with basic education had the highest abortion rate in all cohorts, but the differences were more pronounced in later cohorts. For instance, 20-year-olds in the 1950s cohort had 14 first abortions per 1000 women if they had basic education, but 12 if it was upper secondary. In the 1960s cohort the corresponding figures were 28 and 15 per 1000 women, and in the 1970s cohort, 26 and 10 per 1000 women. Women with at least an undergraduate degree had low abortion rates—not more than 7 per 1000 women—across all age-groups and cohorts. The estimates for young women in the 1950s cohort may be biased downwards owing to the high number of abortions recorded as being for medical reasons. As stated earlier, this number may have been inflated by a delay in establishing the practice of recording social reasons as the actual reasons given.

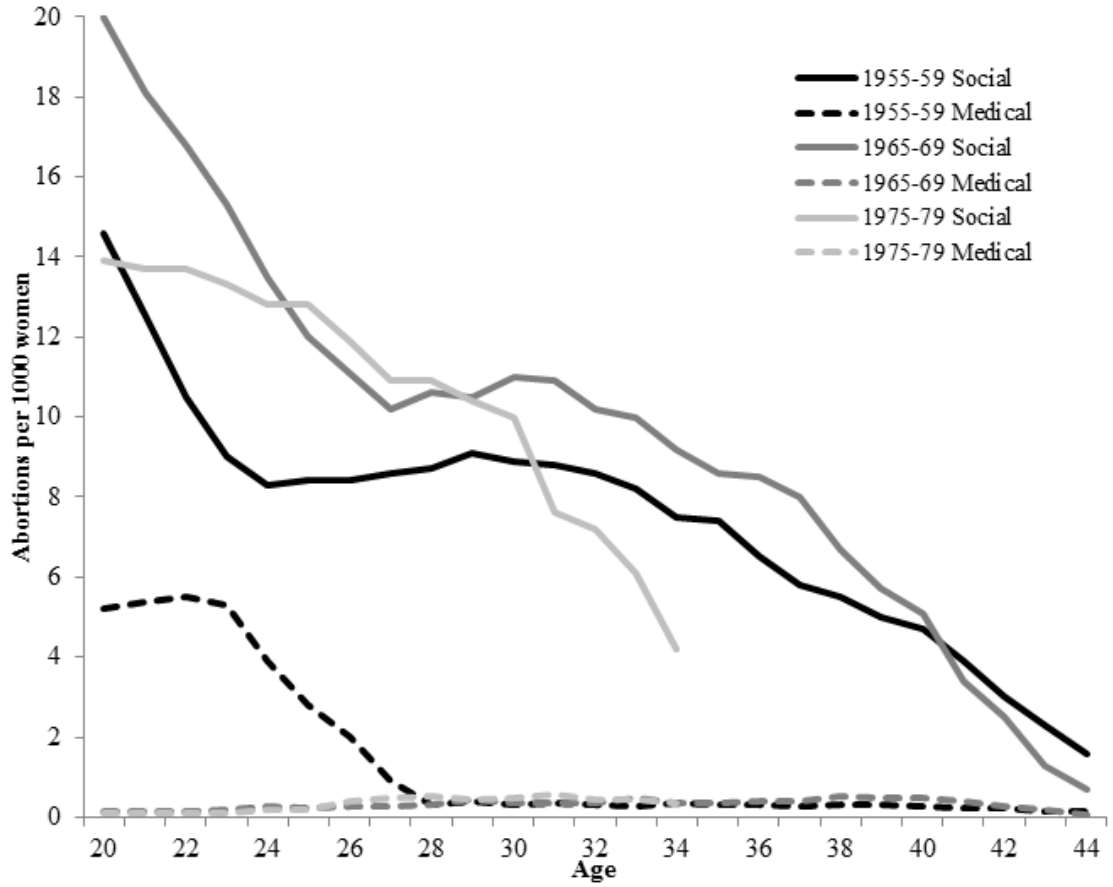


Figure 3.1. First abortion rates per 1,000 women by age, cohort, and indication of abortion (social or medical) in Finland.

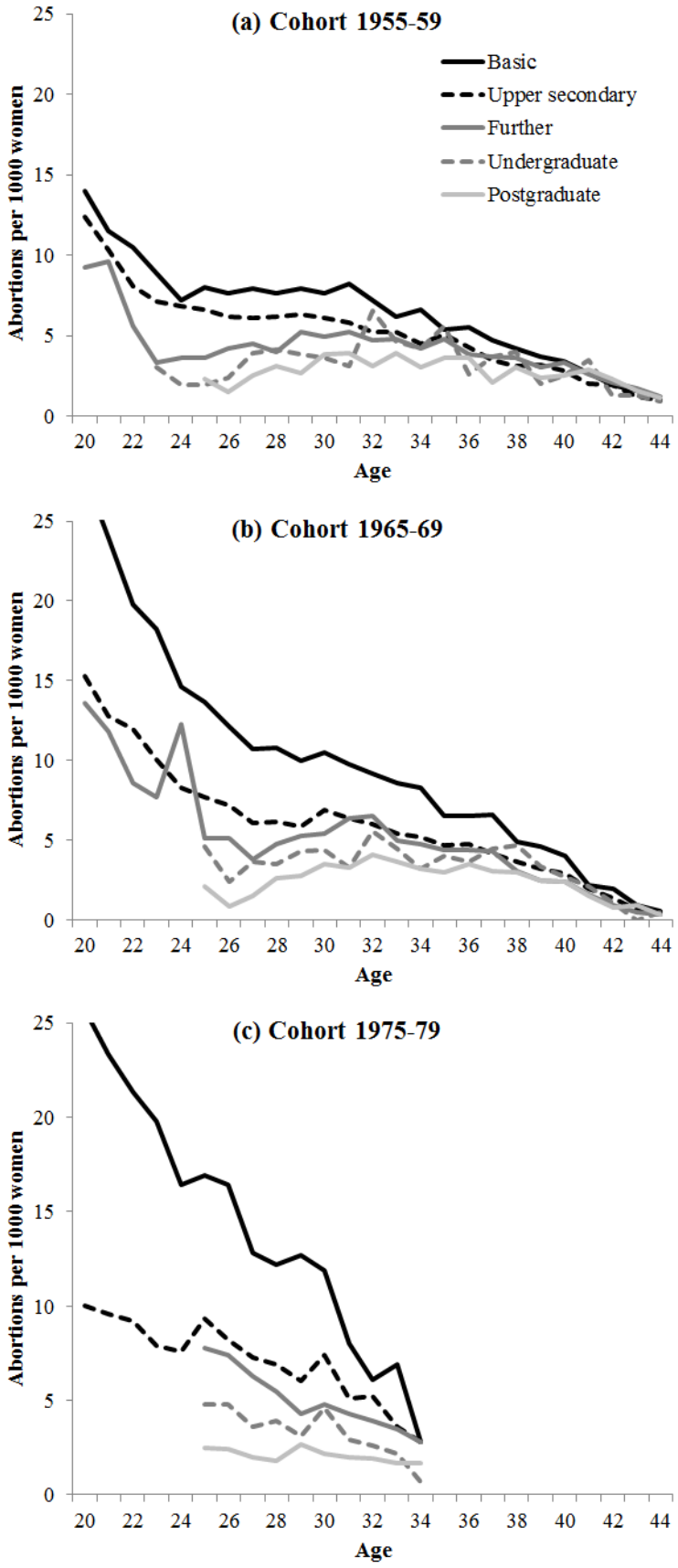


Figure 3.2. The number of first abortions for social reasons per 1,000 women of the same age and education group in Finland.

Figure 3.3 confirms that even when the changing composition of the population by education is taken into account, differences by level of education in the likelihood of abortion increased for later cohorts. The 1970s cohort's curve is furthest away from the 'equality line', indicating that differences by level of education in the likelihood of abortion for that cohort was higher than for the other two. For instance, 20 per cent of women at the lower end of the education distribution had about 28 per cent of abortions in the 1950s cohort, 31 per cent in the 1960s cohort, and 35 per cent in the 1970s cohort.

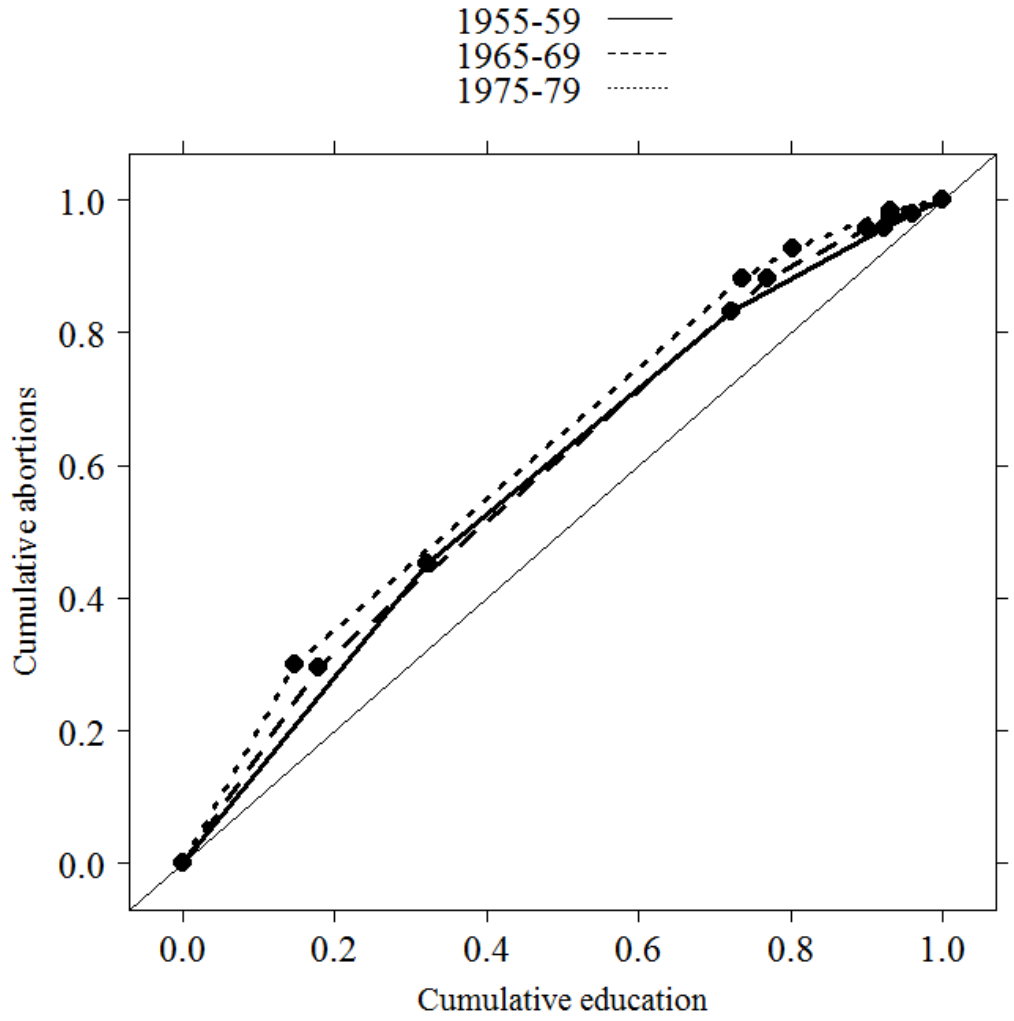


Figure 3.3. Concentration curves of the incidence of first abortion for social reasons against cumulative level of education by cohort in Finland.

The cohort abortion rate standardized for level of education shows that part of the decline in the number of abortions was attributable to the changing distribution by education. Had the distribution been the same for the 1960s and 1970s cohorts as it was for the 1950s cohort, more abortions would have occurred, all else being equal. The number of abortions per 1000 women for the 1950s cohort were 9.6 for 20 to 24-year-olds, 6.2 for 25 to 29-year-olds and 5.5 for 30 to 34-year-olds. Had the education

distribution been the same for the 1960s cohort as it was for the 1950s cohort, there would have been 16.9 (instead of the observed 13.8) abortions per 1000 women in the 20 to 24 age-group, 7.9 for 25 to 29-year-olds (observed 7.1) and 6.4 for 30 to 34-year-olds (observed 6.0). For the 1970s cohort the standardized figure per 1000 women in the 20 to 24 age-group was 15.8 (observed 11.2), 9.5 for 25 to 29-year-olds (observed 7.4) and 5.2 for 30 to 34-year-olds (observed 4.3).

The adjusted event-history models also show that the higher the level of education, the lower the likelihood of abortion (Table 3.2). The association was stronger for the later cohorts than for the earlier ones and for younger women than women in their 30s. For instance, women aged 20-24 with upper secondary education had 17, 39 and 51 per cent lower odds of abortion than women with basic education in the 1950s, 1960s and 1970s cohorts, respectively, but the differences were smaller at older ages. Women with university degrees had the lowest odds of abortion in almost all age-groups and cohorts.

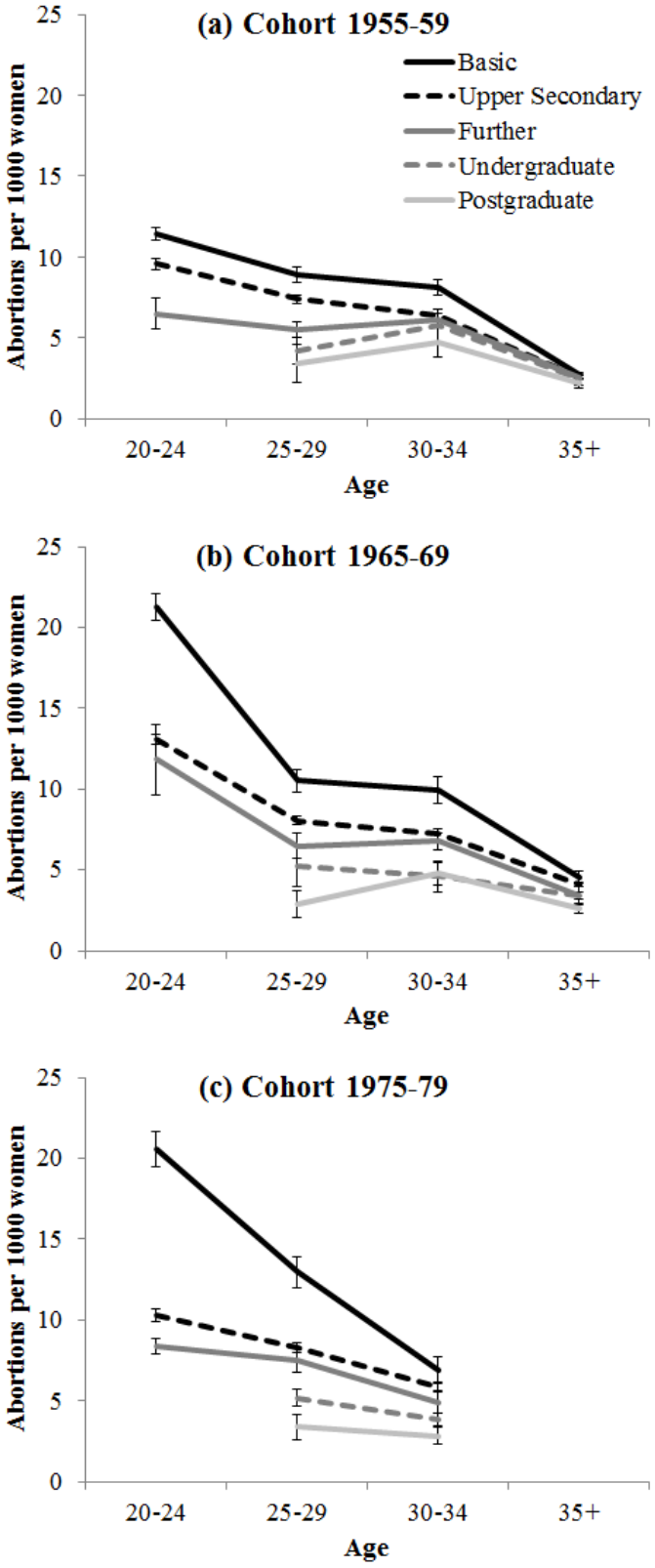
The model that included all cohorts and in which education was interacted with cohorts and age-groups shows that the differences in the associations across cohorts and age-groups were statistically significant at one per cent level (results available on request).

Figure 3.4 shows the average marginal effects of differences in the calculated probability of abortion based on the event-history models. It shows the estimated number of abortions per 1000 women by age and education group. Women with basic education had the highest probability of abortion in all age-groups and cohorts, and the gap by level of education was wider for later cohorts than for earlier ones, especially among young women. For instance, there were on average 11 abortions per 1000 women in the 20 to 24 age-group in the 1950s cohort, and 21 in the 1960s and 1970s cohorts. Upper secondary education was associated with an average of 10 to 13 abortions per 1000 women in this age-group in all cohorts. Women with a university degree had fewer than 6 abortions per 1000 women in all cohorts and age-groups.

Table 3.2. Discrete-time event-history models for first abortions by age group and cohort in Finland. Hazard-odds ratios (HOR) with 95 per cent confidence intervals.

Cohort 1955-59								
Age	**20-24**		**25-29**		**30-34**		**35+**	
	HOR	CI 95%	HOR	CI 95%	HOR	CI 95%	HOR	CI 95%
Education								
Basic (ref.)	1.00		1.00		1.00		1.00	
Upper secondary	0.83	(0.79-0.88)	0.83	(0.77-0.89)	0.79	(0.73-0.86)	0.95	(0.88-1.03)
Further	0.56	(0.48-0.66)	0.62	(0.55-0.68)	0.75	(0.68-0.83)	0.94	(0.85-1.03)
Undergraduate	0.34	(0.18-0.64)	0.47	(0.38-0.57)	0.71	(0.58-0.87)	0.90	(0.76-1.07)
Postgraduate			0.38	(0.27-0.54)	0.58	(0.47-0.71)	0.81	(0.68-0.96)
Cohort 1965-69								
Education								
Basic (ref.)	1.00		1.00		1.00		1.00	
Upper secondary	0.61	(0.58-0.64)	0.76	(0.70-0.82)	0.72	(0.66-0.80)	0.90	(0.81-1.00)
Further	0.55	(0.45-0.67)	0.61	(0.53-0.71)	0.68	(0.60-0.77)	0.75	(0.66-0.85)
Undergraduate			0.49	(0.38-0.64)	0.46	(0.36-0.58)	0.75	(0.62-0.91)
Postgraduate			0.27	(0.20-0.36)	0.48	(0.40-0.57)	0.58	(0.49-0.68)
Cohort 1975-79								
Education								
Basic (ref.)	1.00		1.00		1.00			
Upper secondary	0.49	(0.46-0.53)	0.64	(0.58-0.70)	0.84	(0.73-0.97)		
Further	0.40	(0.37-0.44)	0.57	(0.50-0.66)	0.71	(0.58-0.87)		
Undergraduate			0.40	(0.35-0.45)	0.55	(0.46-0.66)		
Postgraduate			0.26	(0.20-0.33)	0.41	(0.32-0.51)		

Notes: All models were estimated separately by cohort and age-group, and include age, education, occupational group, indicator for being childless, months since last birth and its quadratic term, parity, relationship status, place of residence, and immigration status.



Notes: Adjusted for occupational group, indicator for being childless, months since last birth and its quadratic term, parity, relationship status, place of residence and immigration status.

Figure 3.4. The number of abortions per 1,000 women by level of education and age in Finland with 95 per cent confidence intervals estimated using marginal effects at representative values.

3.1.5 Results: occupational group and abortion

I conducted some of the analyses described above by occupational group as a robustness check. The composition of the groups was as follows: upper-level employees are women in managerial, professional and related occupations. Lower-level employees have administrative and clerical occupations. Manual workers typically work in manufacturing or the distribution of goods and services. The 'other' category includes long-term unemployed, farmers, self-employed, pensioners, those outside the workforce, and those who do not belong to any of the other categories (Official Statistics of Finland 2013a).

The occupational composition of the population changed somewhat during the study period, although less dramatically than the distribution by education. The proportion of upper-level employees at age 30 grew from 13 per cent in the 1950s cohort to 20 per cent in the latest cohort. Among women aged 20, students were the largest occupational group (around 40 per cent for the two earliest cohorts and 51 per cent for the latest) (Table 3.3).

Table 3.3. Women's occupational status at ages 20, 25 and 30 by cohort in Finland, weighted % and unweighted N.

Cohort:	**1955-59**			**1965-69**			**1975-79**		
Occup-ational status	**20[a]**	**25[a]**	**30[a]**	**20[a]**	**25[a]**	**30[a]**	**20[a]**	**25[a]**	**30**
Manual worker	22.6	24.8	21.2	19.1	19.7	17.4	15.1	20.4	15.8
Lower-level	25.3	41.8	44.6	24.8	36.2	34.6	13.5	31.9	39.5
Upper-level	0.8	6.6	13.2	1.6	8.0	14.4	1.3	9.5	20.4
Student	39.1	12.1	3.8	41.1	16.8	7.4	50.9	19.1	6.2
Other	10.1	11.9	15.6	12.4	18.2	25.1	18.2	18.0	17.3
Missing	2.1	2.8	1.6	1.1	1.1	1.1	0.9	1.1	0.8
Total = 100% (N)	102,014	101,090	100,554	95,592	95,944	96,462	58,227	58,706	59,149

a) Measured at age 20, 25, or 30 or the nearest year possible (see text). For that reason, Ns for SES are different from education (sometimes measured in different years).

Figure 3.5 shows that ‘other’ and manual-worker groups had relatively more abortions than upper-level and lower-level employees across cohorts. For example, in the earliest cohort, manual workers had an average of 8 abortions per 1000 women at age 25 and upper-level employees 4 per 1000 women. In the 1960s cohort the corresponding rates were 10 and 7 per 1000 women, and in the 1970s cohort 11 and 6 per 1000 women. The ‘other’ group had levels of abortion similar to those of the manual workers’ group. The differences by occupational group did not change substantially over time.

Upper-level and lower-level employees had lower odds of abortion than manual workers. For instance lower-level employees had 10 to 12 per cent and upper-level employees 11 to 29 per cent lower odds of first abortion than manual workers at age 25 to 29, depending on cohort. The associations were stronger for younger women than for women in their 30s, but there was less variation across cohorts than for education (Table 3.4).

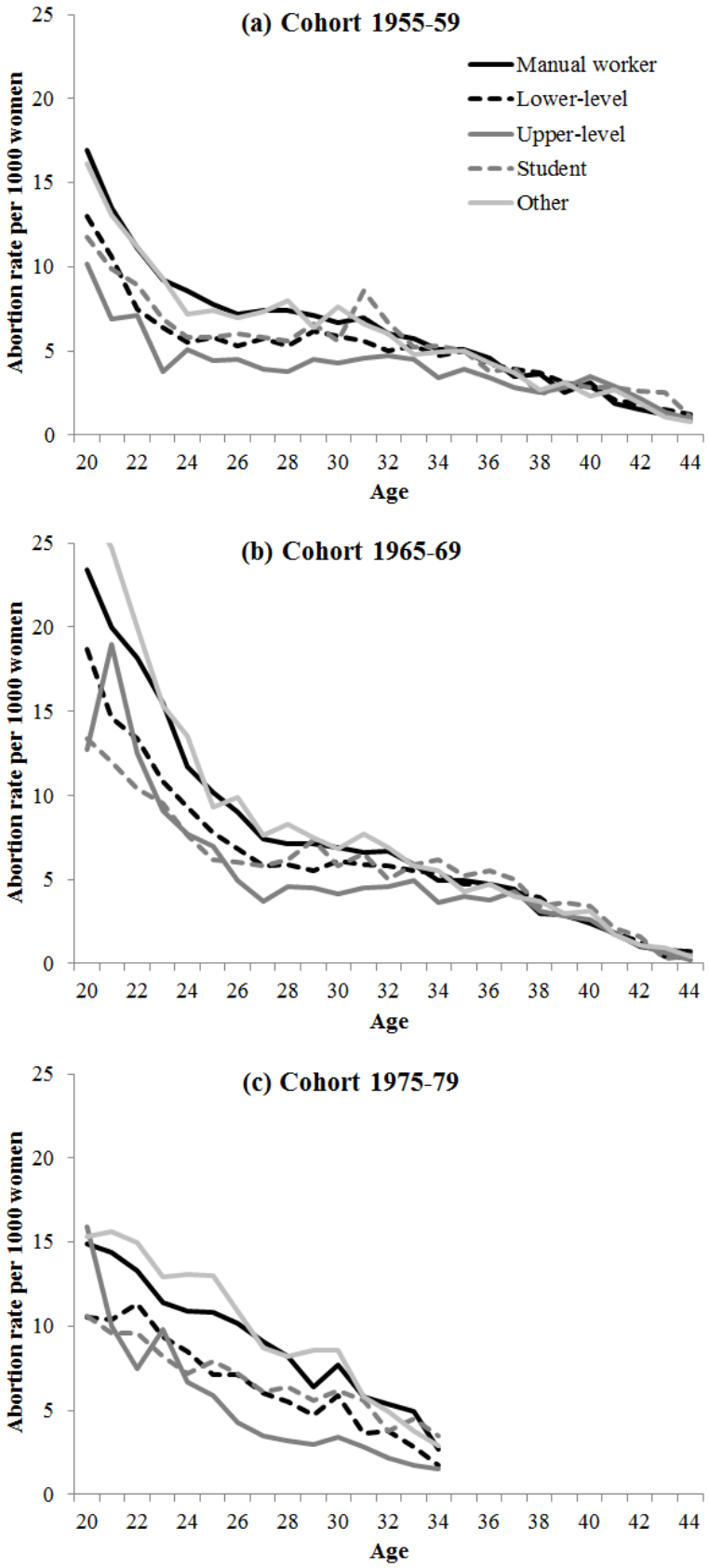


Figure 3.5. The number of first abortions for social reasons per 1,000 women of the same age and occupational group in Finland.

Table 3.4. Discrete-time event-history models for first abortion by age-group and cohort in Finland. Hazard-odds ratios (HOR) with 95 per cent confidence intervals.

Age	**20-24**		**25-29**		**30-34**		**35+**	
COHORT 1955-59	**HOR**	**CI 95%**	**HOR**	**CI 95%**	**HOR**	**CI 95%**	**HOR**	**CI 95%**
Occupational group								
Manual worker (ref.)	1.00		1.00		1.00		1.00	
Lower-level employee	0.77	(0.72-0.83)	0.89	(0.82-0.96)	0.96	(0.88-1.05)	1.06	(0.97-1.15)
Upper-level employee	0.71	(0.52-0.96)	0.89	(0.75-1.05)	0.88	(0.76-1.02)	0.97	(0.85-1.11)
Student	0.71	(0.66-0.76)	0.92	(0.82-1.02)	1.13	(0.95-1.35)	1.08	(0.91-1.28)
Other	0.87	(0.80-0.95)	0.95	(0.86-1.05)	0.95	(0.85-1.06)	0.99	(0.89-1.10)
COHORT 1965-69								
Occupational group								
Manual worker (ref.)	1.00		1.00		1.00		1.00	
Lower-level employee	0.78	(0.73-0.83)	0.90	(0.83-0.97)	1.01	(0.91-1.12)	1.07	(0.97-1.19)
Upper-level employee	0.73	(0.61-0.88)	0.88	(0.76-1.02)	0.98	(0.84-1.14)	1.09	(0.94-1.26)
Student	0.62	(0.58-0.66)	0.83	(0.75-0.91)	0.97	(0.83-1.12)	1.20	(1.04-1.39)
Other	1.00	(0.93-1.08)	0.94	(0.86-1.02)	0.99	(0.90-1.10)	1.04	(0.93-1.15)
COHORT 1975-79								
Occupational group								
Manual worker (ref.)	1.00		1.00		1.00			
Lower-level employee	0.87	(0.78-0.96)	0.88	(0.80-0.96)	0.87	(0.77-0.99)		
Upper-level employee	0.77	(0.58-1.02)	0.71	(0.61-0.83)	0.79	(0.66-0.95)		
Student	0.75	(0.69-0.82)	0.84	(0.76-0.92)	0.89	(0.73-1.08)		
Other	0.95	(0.87-1.05)	0.95	(0.87-1.05)	0.91	(0.79-1.04)		

Notes: All models were estimated separately by cohort and age-group, and include age, education, occupational group, indicator for being childless, months since last birth and its quadratic term, parity, relationship status, place of residence, and immigration status.

3.1.6 Discussion

Interpretation of the main findings

The results of this study show that providing ready access to family planning services and comprehensive sex education in schools does not eliminate differences by level of education in the likelihood of a first abortion. Women with only basic education had a substantially higher likelihood of first abortion than other women and the association was stronger for later than earlier cohorts. One explanation for this pattern is selection into education. Although it was still fairly common for women to have completed only basic education in the 1955-59 cohort, it became increasingly unusual in the later cohorts. Thus, women who have only basic education are probably different from other women in many other characteristics too. This explanation is supported by the fact that changes in occupational group were less dramatic than changes in level of education across cohorts. The occupational composition of the population changed less over time than the composition by education.

The cohort abortion rates standardized for education showed that it is likely that without the increase in education in Finland, relatively more abortions would have occurred in the later cohorts. Thus, a part of the decline in abortion rates in the country is likely to be attributable to the changing educational composition of the population.

The differences by level of education in the likelihood of abortion may arise partly because women with high education have better access to family planning services. Because waiting times are shorter in private clinics than in those provided by the public health service, and the former are more often used by women with high socioeconomic status (Hemminki et al. 1997), it is possible that these women get more timely access to contraceptives than women with low socioeconomic status, which is typically associated with low level of education. Women with high socioeconomic status may also have taken advantage more quickly than those with lower socioeconomic standing of the new family planning services introduced since 1970, which has been the case in other countries (Saurina, Vall-llosera, and Saez 2012). Another possible reason for the difference is suggested by a study in the United States, which found that poorer women felt they had less choice over the contraceptive method they use, because some methods were too expensive (Frost, Singh, and Finer 2007). Perhaps women with low education use less effective methods in Finland for similar reasons although differences are likely to be

smaller than in the United States because of the more generous financial support given to families by the government[10]. The study by Kosunen and colleagues (2004) showed that although use of IUDs was equally common across education groups, highly educated women more often than women with low education used oral contraceptives, indicating that contraceptive choice does differ by education. In addition, highly educated women may use contraceptives more effectively because they have gained better knowledge of pregnancy prevention from their social networks (Kohler 1997). They may also be more literate in health matters, and thus better able to understand and critically assess (reproductive) health information (Nutbeam 2000).

If unintended pregnancies were equally common across all education groups, and the differences in abortion by level of education were due only to the differences in the likelihood of terminating a pregnancy, one would expect to see higher fertility levels among women with high education than among those with low education since highly educated women had fewer abortions. However, there are no large differences in completed family size by education in Finland (Andersson et al. 2009). It is thus more plausible that women with high education simply had fewer unintended pregnancies. This could be the outcome of differences in the frequency of sexual intercourse, but it is more likely that the differences in the likelihood of abortion are explained by variation in contraceptive use.

Strengths and limitations

This study was the first to analyse the association between education and the likelihood of abortion, using a large, representative and reliable longitudinal dataset that was not suffering from drop-out or underreporting. Following the same individuals over time allows analysing how the likelihood of abortion changes for instance by age, which is an advantage compared to cross-sectional studies. In addition, using these longitudinal and reliable data, I was able to distinguish between first and repeat abortion, and therefore focus the analysis on first abortions, which may not be possible in a cross-sectional study using self-reported data on abortion due to severe underreporting of abortion. Another useful feature of the dataset was that it allowed the study to be restricted to those who had an abortion due to social reasons (considerable strain caused by living or other conditions, being younger than 17 or older than 40, or already having at least four children) rather

[10] See section 1.4.3 in this thesis to find more information about the costs of contraceptives in Finland.

than medical reasons (such as a medical problem of the foetus or a parent). This distinction is important because social and medical reasons may entail different decision-making processes: social reasons may be more often cited if the pregnancy was unwanted, whereas abortion may be necessary for medical reasons even if the pregnancy had been wanted in the first place.

Although Finland is in many ways exceptional in the reproductive health services and family policies it provides for its population, the fact that the dataset used for this study is richer and more reliable than those of most other countries (Jones and Kost 2007) may make the results of the study useful elsewhere. Reliable information on differences by level of education in the estimated likelihood of abortion is likely to be of interest to researchers and policy-makers internationally, as most other countries in the world do not have reliable data on abortion and therefore reliable estimates from one country may help researchers in others even if the context differs from Finland.

The study had some limitations. The prevalence of abortions for medical reasons was higher among young women in the 1950s cohort than in the other cohorts, probably owing to delays in implementing change in the classification of reasons for abortion after the change in legislation in 1970. This may compromise the comparability of cohorts. However, when analyses were run using all abortions as outcome for the 1950s cohort, the interpretation of the model was essentially the same (results available on request).

The results obtained by concentration curves suggest that differences in the likelihood of abortion by level of education were higher for later cohorts, if one assumes that the distribution of abortion was constant within each education group (Konings et al. 2009). This assumption may be implausible. For instance, women who had completed years of university education, but had not (yet) graduated, were included in the upper secondary group together with women who never intended to pursue higher education. Moreover, although abortion rates standardized for education suggest that a part of the decrease in abortion was attributable to a rise in the level of education of the women, this inference is valid only on the assumption that all else was equal. Nevertheless, the results provide important descriptive information on how the association between abortion and education changed over time.

Another limitation of the study was that it lacked information on variables not included in registers and, owing to regulations intended to avoid providing information

that could identify someone, important details on some variables that were included. Relevant information not available includes the woman's reason for choosing abortion beyond the indication required by law, the partner's role, if any, in making the choice, pregnancy intentions, and contraceptive use. Also not available was information on factors known to affect the likelihood of an abortion, such as the attitudes and religious background of the women (Bankole, Singh, and Haas 1998).

Owing to the limitations of the data, it was not possible to investigate causal pathways to abortion. Nor was it possible to investigate whether obtaining education itself changes the women's likelihood of abortion or whether there are other unmeasured characteristics which make some women both more likely to obtain high education and less likely to have abortions. Women's contraceptive use, sexual activity, and willingness to terminate an unintended pregnancy affect their likelihood of having an abortion (Bongaarts 1978). These characteristics may depend on level of education, and thus partly explain the differences observed in this study. Since these characteristics were not measured in this study, their role could not be examined.

Despite the limitations, the strengths of the register data mean that the study was able to produce new and reliable information on the association between education and abortion over time.

3.1.7 Conclusions

Analyses of register data on three birth cohorts of Finnish women (born in 1955–59, 1965–69 and 1975–79) over the reproductive period of their lives showed that differences by education in the likelihood of having an abortion increased over time. It would be useful if future studies used qualitative and survey data to investigate the effects of such variables as contraceptive use, pregnancy intentions, and partner's characteristics in order to study the mechanisms causing the differences in the likelihood of abortion by education. It is important to ensure that all women, whatever their educational status, have easy access to affordable family planning services and know how to use contraceptives efficiently. Furthermore, use of long lasting reversible contraceptive methods such as IUDs may help some women avoid unwanted pregnancies because these eliminate contraceptive failure due to user error (Frost, Singh, and Finer 2007; Kost et al. 2008; Madden et al. 2011). Discontinuation rates of these methods are low and they are also suitable for young women who have never been pregnant (e.g. Grunloh et al. 2013).

3.2 Labour Force Participation and the Likelihood of Abortion in Finland over Three Birth Cohorts[11]

Abstract

There is a lack of studies on the association between labour force participation and abortion. This study examined how the likelihood of having an abortion depends on being employed, unemployed, student, or outside the workforce using Finnish register data from three birth cohorts (born in 1955-59, 1965-69 and 1975-79) of more than 270,000 women. The results differed depending on whether all women or only pregnant women were studied and on the cohort analysed. Unemployed women had a high likelihood of abortion when all women were studied, but among pregnant women students had the highest likelihood. The direction and strength of the association varied by relationship status, age, and parity. The results show that the likelihood of abortion depends on women's economic position. More studies on contraceptive use and pregnancy intentions in Finland are needed to identify the mechanisms behind these findings.

Keywords: Induced abortion; Finland; register data; reproductive health.

[11] The results presented in this section have been published in Väisänen, Heini (2015) "Labour Force Participation and the Likelihood of Abortion in Finland over Three Birth Cohorts," *Finnish Yearbook of Population Research,* 50: 5–20.

3.2.1 Introduction

I summarised in section 3.1.1 how previous studies have shown SES and abortion to be associated. There is a lack of studies investigating the relationship between labour force participation and the likelihood of having an abortion, and whether it has changed over time. The likelihood of abortion may differ by labour force participation status because women in difficult economic positions may want to postpone childbearing until their situation improves and they are better able to take care of the child (Hrdy 1999) or women may wish to avoid opportunity costs of childbearing (Becker 1991) in particular if they have high education (Kreyenfeld 2010). In Finland, young women chose to postpone their childbearing during the recession in the 1990s while waiting for a more stable economic situation (Lainiala 2014). Students may find it particularly hard to start childbearing regardless of the macro-economic environment, since the basic maternity leave allowance is low (currently €24 per working day (KELA 2013)) and the allowance reduces their student benefit. Women on fixed-term employment contracts postpone childbearing not because they are worried about their financial wellbeing, but because they are concerned about their future career prospects (Sutela 2013). These results indicate that women are concerned about the direct and opportunity costs of childbearing in Finland.

The relationship between economic uncertainty and the likelihood of abortion is not independent of the wider context of women's lives. For instance, having a partner with a stable labour market position may encourage some women to have children despite their own uncertain status, and the number of children they already have interacts with their views on a suitable timing for future childbearing. Moreover, strong motivation to avoid childbearing is associated with consistent contraceptive use (Frost, Singh, and Finer 2007; Moreau et al. 2013), which in turn is negatively associated with likelihood of unintended pregnancy and subsequently abortion.

In this study I aim to examine whether the likelihood of obtaining an abortion differs depending on whether women are employed, unemployed, students or outside the workforce (e.g. staying home to take care of the family, on pension, or in military service). I analysed the relationship in three points in time: when the women were approximately 20, 25 and 30 years old. I chose these points partly due to data restrictions, but they also represent how the association changes from early adulthood to later on, when women may have reached a more stable situation of life.

3.2.2 Data and methods

The dataset I used in this study has been described in section *2.1.2 Data of the Study*.

I chose labour force participation (employed, unemployed, student, and 'outside workforce'[12]) as the main explanatory variable. Other relevant characteristics I controlled for in the analyses: relationship status (with divorced and widowed combined in the analyses, since there were few widowed women in the sample), place of residence, immigration status (I classified women born in Finland and speaking Finnish or Swedish as her native language a native Finn, but non-native otherwise), and education, which was classified as low; middle; and high (tertiary) education (see section 2.1.2 for more information on how and when the variables were measured). I also created a variable which approximates the macro-economic environment specific to the age group and year of interest by dividing the number of unemployed women by the number of employed women and multiplying the result by 100. I called the variable 'sample unemployment' and used it as a control variable in the multivariate analysis.

I included the three time points when labour force participation was measured (approximate ages of 20, 25 and 30) in the analysis. Since labour force participation was recorded based on activity in the last week of the year (Official Statistics of Finland 2013a), I measured the incidence of abortions in the following year, that is, if labour force participation status was measured at age 20, abortions were measured in the year the woman turned 21 etc. I included births from April the following year until March the year after that in order to exclude last trimester pregnancies at the time of measuring the labour force status, because at these late stages the pregnancy may already affect the labour force status, and the purpose was to avoid reverse causation. In the text, I refer to the first point in time the analysis was conducted as age 20, the second as age 25 and the third as age 30 although sometimes this is only the approximate age.

[12] Although these statuses mostly describe the women's labour market situation correctly, there are a few caveats to keep in mind. Statistics Finland classifies students who work (part- or full-time) as 'employed'. Women on maternal leave who have a job waiting for them have been classified as 'employed', whereas those who do not have been classified as 'outside workforce'. Some women on maternal leave may be classified as students, if that is their main type of activity rather than taking care of their children at home. Women who stay home for long periods of time (e.g. use child care leave allowing them to stay at home until their youngest child is three years old) are typically classified as 'outside workforce'. (Official Statistics of Finland 2013a, 2013d). Thus, most of those outside the workforce in this study are likely to be women taking long periods of time off work to take care of their children at home.

I analysed these data using descriptive statistics and logistic regression. The outcome variable was having an abortion. Although the motivation to have an abortion is likely to be different depending on whether it was due to medical or social indication and may differ depending on whether it is the first or a repeat abortion, I included all abortions in order to maximise the number of outcome events. The standard errors in the logistic models were robust and took into account the longitudinal nature of the data. I conducted the models separately for each cohort because the effects of the covariates may depend on cohort. I first conducted the models for all women to get an understanding of the levels of risk in the general population, and then only to women who became pregnant during the study period in order to focus the analysis on the women who were at risk of having an abortion (excluding women who had a miscarriage, since information on spontaneous pregnancy loss was not included in the dataset).

I analysed the main explanatory variable—labour force participation—first together with age. Next, I added all the other covariates (age, relationship status, education, parity, place of residence, and immigration status) to the models. In the model for pregnant women I also included a measure of time since previous birth as it has been shown that abortions shortly after birth are relatively common in Finland (Vikat, Kosunen, and Rimpela 2002). Finally, I interacted the covariate of interest, labour force participation, with relationship status, parity, education and age in order to see whether its association with the outcome varies according to these socio-demographic characteristics. I included the interactions that were significant at five per cent level in joint Wald tests of the hypothesis that all of the categories of the interaction term have no association with the outcome in the final models. I illustrated these effects using the marginal probabilities at representative values approach (Williams 2012).

I conducted a model where data from all cohorts were pooled and cohort effect was added as one of the covariates and interacted with all other covariates in order to test the statistical significance of the cohort differences (results not shown). Among all women, all interactions between cohort and the main effects of age, partnership status, education and labour market status were statistically significant at one per cent level. Among pregnant women, all interactions between cohort and the main effects of age, partnership status and labour market status were statistically significant at one per cent level, but the interaction between education and cohort was not. The main effect of cohort was statistically significant at 0.1 per cent level in both models. Thus, the cohort

differences presented in the paper are statistically significant. All analyses were conducted in Stata version 13.

3.2.3 Results

The descriptive statistics in Table 3.5 show that most women were employed at all stages of the study, ranging from 31 to 56 per cent at age 20, 60 to 71 per cent at age 25, and 66 to 80 per cent at age 30 depending on cohort. Almost half of women aged 20 were students in the latest cohort, compared to around one-third in the other two cohorts. Less than five per cent of women were unemployed in the earliest cohort at all ages, but between seven and thirteen per cent of women were unemployed in the other two cohorts at each time point. The rest of the women were outside the workforce.

Although most women were single in the youngest age group (72 to 83 per cent depending on cohort), many got married by age 30 (45 to 65 per cent depending on cohort). In the earliest cohort, women aged 20 or 25 who were cohabiting were classified as single, because information on cohabitation has only been available in the registers since 1987. The level of education increased over time. Although a fifth of women had only completed compulsory education in the earliest cohort, only one in ten had this level of education in the 1970s cohort. Most women had no children at age 20 (84 to 97 per cent depending on cohort), but by age 30 around a half of women in the two latest cohorts and two-thirds in the earliest cohort had had at least one child. In each age and cohort group, one to two per cent of women had an abortion during the study period, whereas between five and 13 per cent had a birth (Table 3.5).

Table 3.5. The distribution of the main socio-demographic characteristics in the sample, weighted % and unweighted N.

1a) Cohort 1955-59

		Age ~20		Age ~25		Age ~30	
		%	N	%	N	%	N
Labour force participation	Employed	55.7	21,720	70.6	69,418	80.0	78,923
	Unemployed	3.5	1,423	3.8	3,973	4.0	4,218
	Student	27.5	10,218	11.2	10,661	3.4	3,366
	Outside workforce	13.4	5,295	14.4	14,237	12.6	12,323
Relationship status	Single	75.3	29,049	48.4	47,872	22.2	22,111
	Married	23.9	9,239	48.9	47,462	64.5	62,598
	Cohabiting					8.7	9,077
	Divorced/ Widow	0.8	368	2.7	2,955	4.6	5,044
Education	Basic	26.1	10,655	25.6	26,365	22.8	23,569
	Secondary	62.8	23,935	49.1	48,226	39.7	39,630
	Further	11.0	4,066	17.6	16,622	27.0	25,963
	Undergraduate			5.6	5,121	4.6	4,355
	Postgraduate			2.2	1,955	5.8	5,313
Parity	No children	84.0	32,115	61.2	59,039	34.5	33,379
	One child	13.4	5,442	24.5	24,743	26.9	26,916
	Two children	2.5	1,049	12.3	12,494	29.5	29,345
	Three or more	0.1	50	1.9	2,013	9.1	9,190
Had an abortion		1.6	906	1.1	1,650	1.0	1,482
Had a birth		9.1	3,579	12.1	11,819	10.3	10,115

1b) Cohort 1965-69

		%	N	%	N	%	N
Labour force participation	Employed	51.5	49,337	59.7	56,418	65.6	61,951
	Unemployed	7.2	7,084	12.4	12,198	13.0	12,978
	Student	34.4	31,194	15.7	14,506	6.5	6,226
	Outside workforce	6.9	6,826	12.2	12,000	15.0	14,325
Relationship status	Single	83.2	77,910	38.0	36,041	23.4	22,683
	Married	6.2	6,055	30.8	28,722	49.2	45,643
	Cohabiting	10.5	10,362	29.7	28,736	23.3	22,782
	Divorced/ Widow	0.1	114	1.5	1,623	4.1	4,372
Education	Basic	22.3	22,626	16.0	16,675	14.3	14,932
	Secondary	76.1	70,289	70.4	66,298	49.3	47,367
	Further	1.6	1,526	7.6	6,904	20.9	19,463
	Undergraduate			2.7	2,346	4.3	3,886
	Postgraduate			3.4	2,899	11.2	9,832
Parity	No children	96.2	90,406	74.6	69,379	43.6	40,602
	One child	3.5	3,700	16.2	16,316	23.3	22,571
	Two children	0.3	329	7.7	7,916	24.1	23,320
	Three or more	0.0	6	1.5	1,511	9.1	8,987
Had an abortion		2.0	2,767	1.3	1,840	1.2	1,675
Had a birth		4.8	4,927	12.8	12,115	11.4	10,749

(Table 3.5 cont.)
1c) Cohort 1975-79

		Age ~20		Age ~25		Age ~30	
		%	N	%	N	%	N
Labour force participation	Employed	31.4	18,288	63.2	36,000	74.3	43,033
	Unemployed	13.2	8,222	8.4	5,394	6.8	4,426
	Student	47.3	25,945	16.9	9,529	6.1	3,696
	Outside workforce	8.1	5,257	11.5	7,151	12.8	7,556
Relationship status	Single	71.7	40,416	40.7	23,663	24.2	14,537
	Married	3.9	2,350	21.8	12,327	45.1	25,199
	Cohabiting	24.3	14,887	36.4	21,276	27.7	16,765
	Divorced/ Widow	0.1	59	1.1	808	3.1	2,210
Education	Basic	17.5	12,319	11.5	8,325	10.4	7,352
	Secondary	54.6	30,222	54.3	31,812	39.1	24,417
	Further	27.9	15,171	10.5	5,837	8.6	4,890
	Undergraduate			17.8	9,239	25.0	13,558
	Postgraduate			5.9	2,861	16.9	8,494
Parity	No children	96.7	55,143	78.8	43,575	51.2	28,224
	One child	3.0	2,330	13.3	9,022	21.9	13,375
	Two children	0.3	230	6.4	4,447	19.1	11,951
	Three or more	0.0	9	1.5	1,030	7.8	5,161
Had an abortion		1.5	1972	1.3	1,648	0.8	1,052
Had a birth		4.7	3,180	10.0	5,981	12.4	7,040

Table 3.6 shows the results of the logistic regression analyses of the likelihood of abortion among all women using logistic regression. The unemployed had 58 to 84 per cent higher odds of abortion than employed women in the age-controlled models depending on cohort, which declined to 25 to 50 per cent higher odds after the other variables were controlled for. Students did not differ from employed women statistically significantly in the earliest cohort, but had 23 to 24 per cent lower odds of abortion in the other two in the multivariate models. Although women outside the workforce had higher odds of abortion than employed women in the age controlled models (24 to 77 per cent depending on cohort), the association disappeared in the 1970s cohort after controlling for the other covariates. In the other two cohorts they still had 11 to 20 per cent higher odds. Other covariates were also associated with increased odds of experiencing an abortion, including young age, not having a partner, low education, high parity, not being a native Finn and living in an urban area.

Table 3.6. The likelihood of abortion among all women, odds ratios of main effects.

Cohort	**1955-59**		**1965-69**		**1975-79**	
	(1)	**(2)**	**(1)**	**(2)**	**(1)**	**(2)**
Labour market status						
Employed	1.00	1.00	1.00	1.00	1.00	1.00
Unemployed	1.84***	1.50***	1.58***	1.26***	1.69***	1.25***
Student	0.91	0.96	0.76***	0.76***	0.89**	0.77***
Outside workforce	1.24***	1.11*	1.67***	1.20***	1.79***	0.95
Age						
~20	1.00	1.00	1.00	1.00	1.00	1.00
~25	0.69***	0.68***	0.59***	0.64***	0.81***	0.70***
~30	0.61***	0.55***	0.52***	0.48***	0.52***	0.38***
Sample unemployment		0.94**		1.00		0.68**
Relationship status						
Single		1.00		1.00		1.00
Married		0.36***		0.37***		0.44***
Cohabiting		0.62***		0.64***		0.69***
Divorced		1.19*		1.10		1.04
Education						
Low		1.00		1.00		1.00
Middle		0.75***		0.55***		0.43***
High		0.45***		0.27***		0.27***
Parity						
No children		1.00		1.00		1.00
One child		1.94***		2.49***		2.69***
Two children		2.57***		2.87***		3.05***
Three or more		3.65***		3.42***		3.74***
Not native		1.78***		1.40***		1.34***
Province						
South		1.00		1.00		1.00
West		0.80***		0.81***		0.95
East		0.88*		0.84***		0.99
Oulu		0.72***		0.81***		0.95
Lapland		0.90		1.22**		1.26**
Aland		0.53		0.78		1.32
Level of urbanisation						
Urban		1.00		1.00		1.00
Semi-Urban		0.93		0.81***		0.84***
Rural		0.76***		0.75***		0.78***

* p<0.05, ** p<0.01, *** p<0.001

(1) Age-controlled model; (2) Multivariate model

Notes: As information on cohabitation has only been available since 1987 in the registers, its estimates for the earliest cohort are only indicative.

Table 3.7 shows the results of age-controlled and multivariate main effects models among women who experienced a pregnancy during the study period. In this group, students had the highest likelihood of abortion in all cohorts after controlling for all covariates: the odds were 34 to 95 per cent higher than for employed women depending on cohort. Contrary to the model where I included all women, unemployed women were not distinguishable from employed women in the 1970s cohort after all covariates were controlled for, but in the other two cohorts their odds of abortion were 37 to 52 per cent higher compared to employed women. When it comes to other covariates, the associations were similar to the models which included all women: young age, not having a partner, low education, high parity, not being a native Finn, and living in an urban area were associated with increased likelihood of an abortion.

Labour force participation did not interact with relationship status, parity, education or age in the 1950s cohort models for all women at five per cent significance level, but it did with relationship status and age in the 1960s cohort and also education in the 1970s cohort (Figure 3.6). Women who were born in the 1960s and were unemployed or outside the workforce had the highest probability of abortion in all relationship status groups, but the probability was higher for those without a partner than those married or cohabiting. Although the differences by labour force status were small among women in their 30s, women in their early 20s who were outside the workforce or unemployed had a higher probability of abortion than women in the other labour force status groups.

According to the fitted models, single and divorced or widowed women in the 1970s cohort who were employed or unemployed had a higher predicted probability of obtaining an abortion than students and those outside the workforce (Figure 3.6). There were no big differences by labour force status among married and cohabiting women. Like in the 1960s cohort, there were only modest differences in the probability among women aged 30, but when the women were ten years younger, the probability was particularly high if they were unemployed or students (around 2.5 per cent). Among women with low education, the probability was high in all labour force status groups (approximately two to three per cent), but 1.5 per cent or less in other educational groups. Interestingly, among women with low education students had the second highest probability of abortion although in other educational groups it was as low as or lower than that of employed women.

Table 3.7. The likelihood of abortion among pregnant women, odds ratios of main effects.

Cohort	**1955-59**		**1965-69**		**1975-79**	
	(1)	**(2)**	**(1)**	**(2)**	**(1)**	**(2)**
Labour force participation						
Employed	1.00	1.00	1.00	1.00	1.00	1.00
Unemployed	2.04***	1.52***	1.45***	1.11*	1.37***	0.93
Student	1.98***	1.95***	2.21***	1.85***	1.72***	1.34***
Outside workforce	1.29***	1.20**	1.43***	1.39***	1.20***	1.04
Age						
~20	1.00	1.00	1.00	1.00	1.00	1.00
~25	0.57***	0.71***	0.25***	0.50***	0.44***	0.66***
~30	0.62***	0.76***	0.27***	0.45***	0.24***	0.43***
Sample unemployment		0.98		0.99**		0.94
Relationship status						
Single		1.00		1.00		1.00
Married		0.13***		0.089***		0.086***
Cohabiting		0.24***		0.22***		0.20***
Divorced		0.71***		0.58***		0.56***
Education						
Low		1.00		1.00		1.00
Middle		0.77***		0.83***		0.78***
High		0.41***		0.39***		0.44***
Parity						
No children		1.00		1.00		1.00
One child		1.13		1.16*		1.00
Two children		2.99***		2.58***		2.15***
Three or more		4.35***		3.26***		2.52***
Years since last birth		1.08***		1.09***		1.06***
Not native		1.51*		1.66***		1.46***
Province						
South		1.00		1.00		1.00
West		0.73***		0.73***		0.88*
East		0.84**		0.76***		0.85*
Oulu		0.61***		0.61***		0.78***
Lapland		0.75**		0.90		0.96
Aland		0.38**		0.62*		1.53
Level of urbanisation						
Urban		1.00		1.00		1.00
Semi-Urban		0.84**		0.74***		0.78***
Rural		0.68***		0.68***		0.70***

* p<0.05, ** p<0.01, *** p<0.001

(1) Age-controlled model; (2) Multivariate model

Notes: As information on cohabitation has only been available since 1987 in the registers, its estimates for the earliest cohort are only indicative.

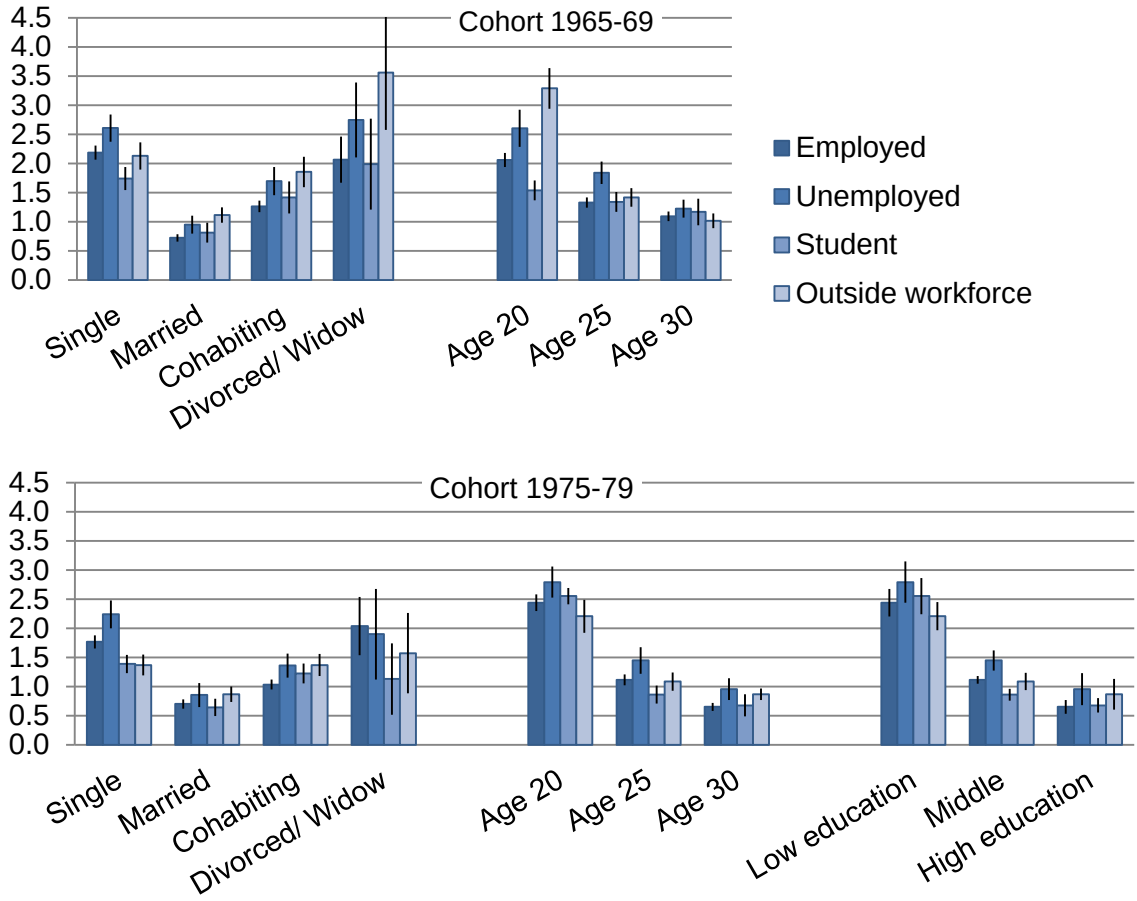


Figure 3.6. Marginal probabilities (%) of abortion: significant interaction effects among all women with 95% CIs, controlling for other variables in the model, as shown in Table 3.6.

Among women who experienced a pregnancy, the interactions of labour force status with relationship status and parity were significant in all cohorts. In addition, the interaction of labour force status with age was significant in the 1960s cohort, and with education in the 1970s cohort (Figure 3.7).

The marginal probability of abortion was over 20 per cent among single women in all labour force status groups in the 1950s cohort (Figure 3.7). The probability was markedly lower (less than 10 per cent) for married women in all labour force status groups. Married and cohabiting women had the highest probability within the respective relationship status group if they were unemployed, whereas for single women the probability was highest among students. Women who had two or fewer children were less likely to terminate a pregnancy if they were employed compared to other labour status groups, but women with at least three children were less likely to terminate a pregnancy if they were outside the workforce.

The marginal probability of abortion was more than 30 per cent among single women in all labour force status groups in the 1960s cohort, compared to less than 10 per

cent among married women (Figure 3.7). Childless women who were employed had markedly lower probability of abortion than other childless women, but among women with one to two children those who were employed had the highest probability. The interaction between age and labour force status revealed that at age 20 students and those outside the workforce had the highest probability of abortion, but the differences were small in later ages. In the 1970s cohort the differences between different labour status groups were smaller than in the other two cohorts.

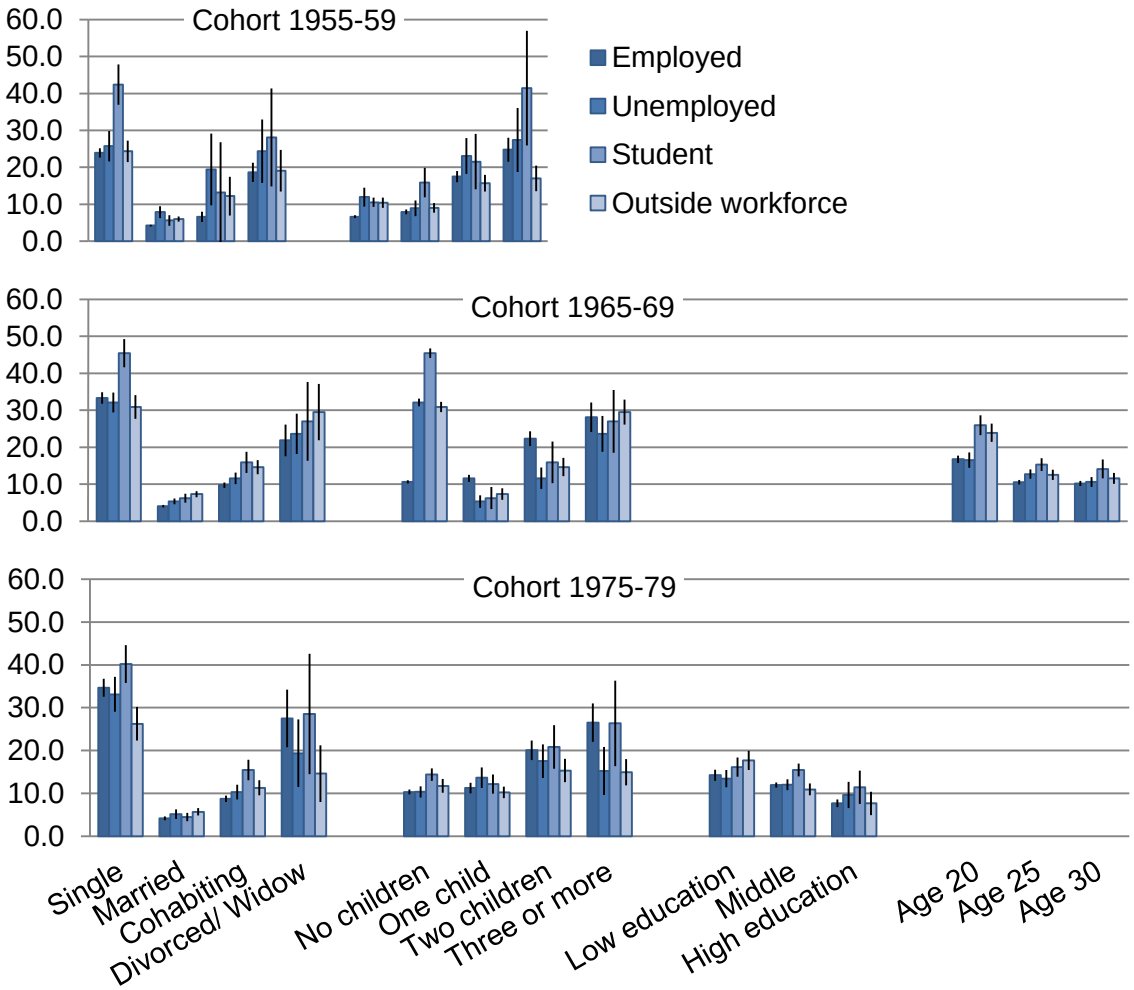


Figure 3.7. Marginal probabilities of abortion: significant interaction effects among pregnant women with 95% CIs, controlling for other variables in the model, as shown in Table 3.7[13].

[13] As information on cohabitation has only been available since 1987 in the registers, its estimates for the earliest cohort are only indicative.

3.2.4 Discussion

My analyses of the likelihood of abortion among all women showed that unemployed women had a high likelihood of abortion in all cohorts. This may be because they wish to postpone childbearing due to the uncertainty of their economic situation and due to the possible difficulties childbearing may impose on finding work later on (Becker 1991; Hrdy 1999; Kreyenfeld 2010; Sutela 2013). This was further supported by the interaction effects showing that women without partners (single, divorced, or widowed women) had a relatively high likelihood of abortion if they were also unemployed, but being unemployed was less strongly associated with the likelihood of abortion for cohabiting and married women, who were perhaps able to count on their partner's support. Interestingly, the positive association between unemployment and the likelihood of abortion was stronger among women born in the 1950s than among the other two cohorts. As Appendix figure 3.1 (see section *3.2.5 Appendix*) shows, unemployment was much lower when the earliest cohort of women were in their 20s and 30s than when the later cohorts were of that age. At times of low unemployment there is more selection into unemployment than during times of macroeconomic hardship, when many lose their jobs. It may be that the women in the earliest cohorts were disadvantaged in other ways as well, and therefore had more difficulties to use contraceptives efficiently (e.g. due to lack of knowledge of or means to access family planning services).

Contrary to findings showing an increase in educational differences in the likelihood of abortion over time among Finnish women (Väisänen 2015), the results of this study show that the importance of labour force participation in explaining the likelihood of abortion has decreased over time. Although being unemployed or outside the workforce was positively associated with the likelihood of abortion in the two earliest cohorts, these differences were modest in the 1970s cohort in particular when only pregnant women were studied. Perhaps access to and knowledge of family planning services depends less on labour force status and more on other characteristics of the women, such as education, among the later compared to the earlier cohorts.

When only pregnant women were analysed, the unemployed had a higher likelihood of abortion than employed women in the 1950s and 1960s cohorts, but no marked difference was found in the 1970s cohort even when interacted with other covariates: unemployed women had similar or lower likelihood of abortion than employed women regardless of their relationship status, age, education or parity

indicating that factors other than labour force participation were more important in predicting the likelihood of abortion for these women.

Pregnancy decision-making is likely to be affected by the macro-economic situation (Sobotka, Skirbekk, and Philipov 2011; Testa and Basten 2014). During difficult times when the prospects of finding a job are not good, many women may wish to postpone childbearing until the economic prospects have improved. Interestingly, employed parous women had a higher likelihood of abortion than other women with children in the 1960s cohort, but among women with no children it was the other way around. Perhaps women with families were particularly concerned about opportunity costs of childbearing in this cohort, where women were in their late 20s and 30s during the severe recession years of the 1990s.

When I studied all women, students had a low likelihood of having an abortion, but the association reversed when I restricted the analysis to women who experienced a pregnancy. This may indicate that students have a high motivation to avoid pregnancy—perhaps they want to make sure that they will be able to finish their studies or are concerned about their financial situation—and thus use contraceptives efficiently (Frost, Singh, and Finer 2007; Moreau et al. 2013). Hence, they have low likelihood of abortion when compared to all women due to low number of pregnancies overall. However, should a pregnancy occur, the motivation to avoid childbearing remains strong and many of them decide to terminate the pregnancy.

A study in Germany showed that women with high education tend to avoid childbearing if they are in an uncertain economic position whereas the opposite is true for women with low education (Kreyenfeld 2010). The abortion behaviour of Finnish women does not seem to support this hypothesis: in most of the models labour market status did not interact with education and even when it did, the differences were small. However, this finding does not imply that the hypothesis is untrue—perhaps the lack of differences was due to differences in contraceptive use patterns.

The results of the study may have been affected by changes in family policies during the study period. Since the mid-1980s a home care allowance system has permitted a parent to stay at home without losing his or her job until their youngest child is three years old. In addition, the universal right to day-care of children under age three since 1985 (under age seven since 1996) facilitated combining work and family life (Haataja

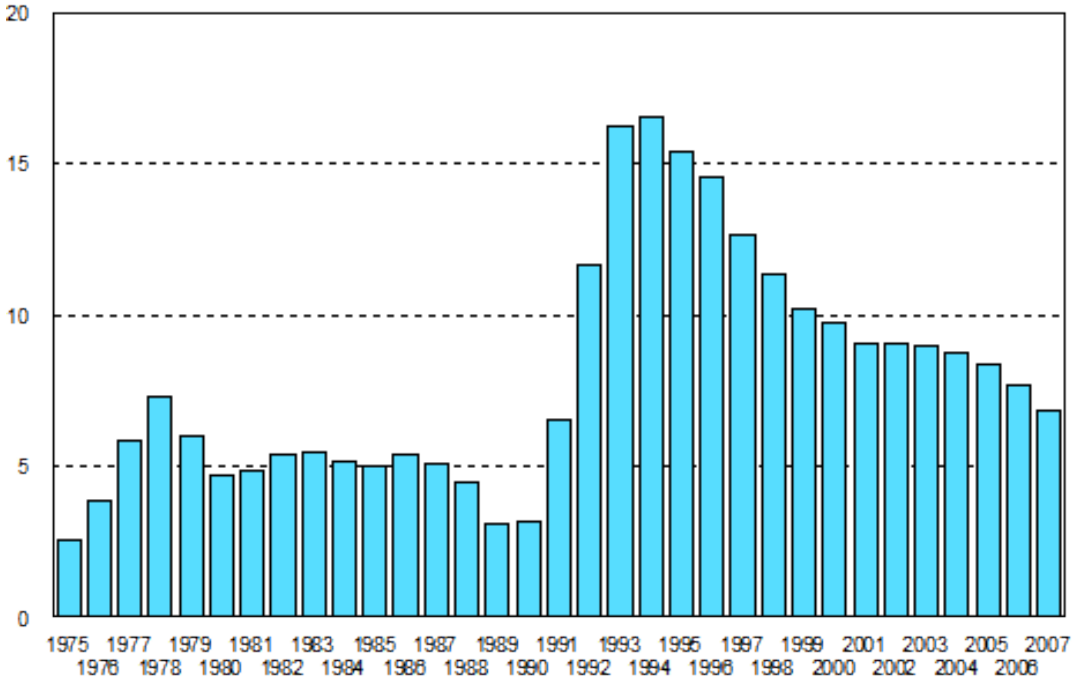
2006; Vikat 2004). These changes have probably changed the composition of the population in the different labour market participation groups. For instance, women with permanent jobs are more likely to use a longer period of the home care allowance before returning to work after childbearing, whereas those in a more uncertain position return to work sooner (Salmi, Lammi-Taskula, and Närvi 2009). Before the allowance was introduced, it may have been women in the more precarious labour market position who stayed home for longer periods of time. These policy changes may have contributed to some of the cohort differences observed in this study: those outside workforce had a higher risk of abortion in the 1950s and 1960s cohorts, but not in the 1970s cohort.

There were limitations in this study. Most importantly, pregnancy intentions of the women were not known although it would have given new insight into the analysis. Also, women outside the workforce were a somewhat heterogeneous group including for instance, pensioners and those in military service, which may reduce the reliability of the variable, but given that my sample consists of women in reproductive age, most of these women were probably taking care of their children at home for long periods of time. Information on spontaneous abortions was not included in this study, as that information is not complete in the registers, which only include miscarriages that required inpatient treatment at a hospital. However, as the focus of the study was in situations in which women *decided* to terminate a pregnancy, it does not compromise the results.

The strengths of the study include the reliable dataset, which does not suffer from dropout or underreporting of abortions. Also, the topic of this study has not been widely studied previously.

Future studies should collect nationwide data on pregnancy intentions and contraceptive use patterns in Finland. At the moment representative data on these topics is not available. This makes it difficult for researchers to identify the motivations behind a decision to terminate a pregnancy. Future research should focus on whether the socioeconomic patterns observed in this study were due to differences in contraceptive use patterns, different attitudes towards abortion, economic concerns, career aspirations, or some other reasons.

3.2.5 Appendix: Unemployment in Finland



Appendix figure 3.1. Unemployment rates (% of active population) in Finland in 1975-2007 (Source: Appelqvist 2008).

4. Educational inequalities in repeat abortion: a longitudinal register study in Finland 1975–2010 [14]

Abstract

The proportion of repeat abortions among all abortions has increased over the last decades in Finland. Few studies have examined how education is associated with the likelihood of repeat abortion and whether the association has changed over time using reliable longitudinal data, although it may help create interventions aimed at avoiding repeat unintended pregnancy and abortion. In this study I analyse a unique set of register data of three birth cohorts followed from age 20 to 45, including about 22,000 cases of repeat abortion using discrete-time event-history models. Low education was associated with a higher likelihood of repeat abortion. Women with low education had abortions sooner after the preceding abortion, were more often single, younger and had larger families at the time of abortion than the highly educated. The educational differences were more significant for later than earlier cohorts. The results show a lack of appropriate contraceptive use, possibly due to lack of knowledge or access to services. There is a need to improve access to family planning services and contraceptives should be provided for free. Register data overcome the common problems of underreporting of abortion and attrition, ensuring the results are reliable, unique and of interest internationally.

[14] The results presented in this chapter have been accepted for publication in the *Journal of Biosocial Science*.

4.1 Introduction

The overall abortion rate in Finland is relatively low (about 9 per 1000 fertile age women since the 1990s), but the proportion of repeat induced abortions among all abortions has increased in the last three decades from approximately 30 to 40 per cent[15] (Heino, Gissler, and Soimula 2011). Few studies have examined whether the increase in repeat abortion has occurred evenly between socioeconomic groups, although such knowledge may help create interventions aimed at avoiding such procedures. Avoiding unintended pregnancy would reduce public expenditures compared to the cost of repeat abortion (Cleland et al. 2011; Frost et al. 2014).

Previous studies on the association between repeat abortion and socioeconomic position have been inconclusive. Cross-sectional studies have identified a positive association between low education and repeat abortion in the United States (Jones et al. 2006), the United Kingdom (Stone and Ingham 2011) and Sweden (Makenzius et al. 2011), but not in Denmark (Osler, David, and Morgall 1997). However, apart from one study (Jones et al. 2006), sample sizes were small (N= 150–798). Longitudinal studies using Finnish register data collected in the early 2000s, following women for up to eight years, suggested that having a low socioeconomic position was associated with increased likelihood of repeat abortion (Mentula et al. 2010; Niinimäki et al. 2009; Väisänen and Jokela 2010). None of these studies compared cohort trends or educational differences. Other characteristics commonly associated with higher incidence of repeat abortion include having children (Heikinheimo, Gissler, and Suhonen 2008; Jones et al. 2006; Makenzius et al. 2011; Niinimäki et al. 2009; Osler, David, and Morgall 1997; Rose, Stanley, and Lawton 2015; Stone and Ingham 2011; Väisänen and Jokela 2010), being unemployed (Das et al. 2009), not being married (Jones et al. 2006; Niinimäki et al. 2009; Väisänen and Jokela 2010) and using barrier methods of contraception (Niinimäki et al. 2009; Osler, David, and Morgall 1997) or oral contraceptives (Heikinheimo, Gissler, and

[15] A part of the increase in the repeat abortion rate shown in the national statistics may have been due to the change in abortion legislation, which became liberal in Finland in June 1970 (see FINLEX 2013 for details regarding the legislation). Going forward, the number of women who have had legal abortions grows and therefore it may appear that the proportion of repeat abortion has increased over time, although a part of the increase may be due to abortions having been recorded more truthfully since the legislation changed. However, this does not compromise the results of this study, as even the oldest women (born in 1955) included, have lived the vast majority of their reproductive life spans during the liberal legislation.

Suhonen 2008; Jones et al. 2006; Niinimäki et al. 2009) rather than long-acting reversible methods of contraception.

My aim in this study is to examine whether there is an educational gradient in the occurrence of repeat abortion, whether the association has changed over time, and how the educational differences vary by time since previous abortion, parity, relationship status, and age using unique and nationally representative longitudinal data based on Finnish administrative registers. These data overcome the problem of underreporting of abortions in surveys (Gissler et al. 1996; Jones and Kost 2007). The analysis covers years from 1975 to 2010, which is a longer period of time and larger scale comparison than in any other previous study of repeat abortion and is able to use population-level data including women who have already completed their childbearing, which is rare (see e.g. Rose, Stanley, and Lawton 2015). Given how difficult it usually is to study this topic using large-scale high-quality data, the results are of interest internationally.

4.2 Data and methods

4.2.1 Data

The dataset I used in this study has been described in section *2.1.2 Data of the Study*. The outcome variable is the occurrence of second or third abortion within one's fertile life span. I analysed only second and third abortions, because there were too few higher order abortions to conduct a reliable analysis (less than two per cent of abortions). The main explanatory variable is education, categorized as low, middle, and high (tertiary) education. The other variables I included in my analyses were: time since previous abortion, parity (all live births in Finland), age, relationship status, place of residence, and nativity (native Finn vs. non-native), because previous studies have found these characteristics associated with repeat abortion (Heikinheimo, Gissler, and Suhonen 2008; Jones et al. 2006; Makenzius et al. 2011; Niinimäki et al. 2009; Osler, David, and Morgall 1997; Väisänen and Jokela 2010). All variables apart from nativity vary in time (see Figure 2.1 for more information on measurement times). Since information on cohabitation was not included in the registers before 1987, all cohabiting women in the 1950s cohort were classified as being single. Because there were only a few widowed women in my data, I grouped them together with divorced women in all cohorts. There were not many women in the data who had high education at the time of their third

abortion (N=36–47 depending on cohort). Thus, in the multivariate analysis of third abortions I combined these women with the middle education group.

4.2.2 Methods

I conducted all analyses for women aged 20 or more, because there was no variation in education before that age, and because few repeat abortions in the sample were obtained before age 20 (five to seven per cent depending on cohort).

I started the analysis by conducting descriptive statistics. I calculated the probability of ever having an abortion (as well as having at least two or three) by dividing the number of women who ever had an abortion by number of all women in each cohort and educational group, both appropriately weighted. I calculated the probability of progressing onto one's second (third) abortion among those who had already had one (two) abortion by dividing the number of women who had had at least two (three) abortions by the number of women who had had at least one (two). In this analysis I measured the number of abortions and level of education when the women were at the age of 45, in the year 2010, the year of death, or the year of emigration, whichever came first. The estimates of the gap between educational groups are thus more conservative than if education was measured at the time of abortion, because some women may have obtained higher education after the event. Next, I calculated the mean number of children, mean age, proportion married and median duration since previous abortion (when appropriate) at the time of first, second and third abortion separately for each educational group and cohort.

I conducted discrete-time event-history models with years since previous abortion as the duration of interest separately for the likelihood of second and third abortion. I only included women who had had at least one abortion in the former models and in the latter only women who had at least two abortions. I conducted the models separately for second and third abortions, and by education and cohort because some of the explanatory variables may be differently associated with the outcome depending on one's education, cohort and the order of abortion. First, each covariate was regressed with the outcome alone, after which fully adjusted models were conducted. Unless an abortion was recorded, women were censored from the analyses when they reached age 45, the year 2010, or time of death or emigration, whichever came first.

I conducted a logistic multilevel model of recurrent events nested within individuals, including all women regardless of the number of abortions they had experienced, to test whether the likelihood of progressing onto the next abortion was dependent on unobserved individual characteristics, but no such dependency was found. Thus I chose the simpler single-level model.

I calculated the educational differences in second and third abortions by time since previous abortion using average marginal effects at representative values (Williams 2012). These probabilities may be relevant for policy-makers who wish to know how the absolute risk varies after the initial abortion in order to plan appropriate interventions.

In the 1970s cohort, the youngest women only reach age 31 by the end of the study period, whereas in the other cohorts even the youngest women reach age 41, which may compromise the comparability of the results between cohorts. Therefore, I conducted sensitivity analyses for women aged 31 or younger for the two earliest cohorts (results reported briefly in text in results section). All analyses were conducted in Stata 13.

4.3 Results

Table 4.1 shows selected characteristics of women of the study by education. Women with low education more often were non-native Finns, had higher average number of abortions, marginally higher mean parity and markedly lower income than women with high education. Education can thus be considered as an indicator of socioeconomic position of these women. It was also associated with other socio-demographic characteristics of interest. The table shows that the proportion of women with low education decreased over time: 26 per cent of women in the earliest cohort had low education, compared to 13 per cent in the latest cohort.

Overall 22, 23 and 15 per cent of all women ever had an abortion, and 5, 6 and 4 per cent had at least two abortions in the 1950s, 1960s and 1970s cohorts respectively (results not shown). A quarter of women with low education in the 1950s cohort, over 40 per cent in the 1960s cohort, and almost a third in the 1970s cohort had at least one abortion, whereas only 9 to 14 per cent of women with high education ever had an abortion, depending on cohort.

Table 4.1. Selected socio-demographic characteristics of women when they were last observed in the study (i.e. at age 45, year 2010, or the time of death or emigration) by education and cohort, weighted % and weighted N.

	Education				Weighted
	Low	*Middle*	*High*	**Total %**	**N**
Cohort 1955-59	*26.0*	*64.0*	*10.0*	*100*	*104,455*
Native Finn	24.0	65.9	10.2	100	100,596
Non-native Finn	87.6	10.6	1.8	100	3,859
Mean parity	1.82	1.88	1.76		
Mean abortions	0.36	0.28	0.16		
Mean of annual income (€)	8,167	9,812	15,251		
Cohort 1965-69	*18.4*	*67.1*	*14.6*	*100*	*101,130*
Native Finn	13.9	70.8	15.3	100	93,423
Non-native Finn	72.1	21.5	6.5	100	7,706
Mean parity	1.82	1.81	1.76		
Mean abortions	0.51	0.31	0.14		
Mean of annual income (€)	10,615	13,855	20,578		
Cohort 1975-79	*13.1*	*46.9*	*40.0*	*100*	*61,633*
Native Finn	8.5	49.2	42.4	100	55,413
Non-native Finn	54.6	26.7	18.6	100	6,219
Mean parity	1.44	1.40	1.13		
Mean abortions	0.39	0.25	0.10		
Mean of annual income (€)	12,740	18,292	26,366		

Notes: The estimates calculated for all women i.e. also include women who never had an abortion; Education was measured at age 30 (or the nearest year possible) and it was assumed that women had received their highest level of education by that age. Income was also last measured at age 30 and it refers to individual's annual taxable income; Parity was measured when the women were last observed in the data, that is in year 2010, age 45 or at the time of death or emigration; Non-native Finn refers to women who were not born in Finland and/or whose native language is not Finnish or Swedish.

Women who had already had one abortion had from 26 per cent (in the 1950s cohort) to 38 per cent probability (in the other cohorts) of progressing to a second abortion if they had low education, whereas highly educated women had only 12 to 15 per cent probability of doing so (depending on cohort). The probabilities of progressing onto third abortion were similar. The differentials between educational groups were more marked for the later than for the earlier cohorts (Table 4.2).

Although 7 to 17 per cent of women with low education (depending on cohort) had a second abortion, only one to two per cent of highly educated women did so. The trends for third abortions were quite similar (Table 4.2).

Table 4.2. Probability of having at least one, two or three abortions within the study period and abortion progression ratios by cohort and education, weighted % and unweighted N.

			Education		
		N	*Low*	*Middle*	*High*
Cohort 1955-59	*Ever had an abortion*	35,891	26.4	22.0	13.5
	Ever had second abortion	8,031	7.0	4.7	1.9
	Ever had third abortion	1,985	1.9	1.1	0.3
	Probability of progression to 2nd abortion		26.4	21.2	14.3
	Probability of progression to 3rd abortion		27.6	23.5	16.6
Cohort 1965-69	*Ever had an abortion*	34,416	45.4	30.1	13.8
	Ever had second abortion	9,389	17.1	7.5	2.1
	Ever had third abortion	2,935	6.8	2.1	0.4
	Probability of progression to 2nd abortion		37.6	24.3	12.4
	Probability of progression to 3rd abortion		40.4	28.6	18.6
Cohort 1975-79	*Ever had an abortion*	20,774	31.3	22.5	9.1
	Ever had second abortion	5,079	11.8	5.5	1.1
	Ever had third abortion	1,587	4.8	1.6	0.2
	Probability of progression to 2nd abortion		37.7	24.8	14.9
	Probability of progression to 3rd abortion		39.4	27.5	18.7

Among all women regardless of their level of education, the median duration since previous abortion at the time of second abortion was 56, 65, and 45 months in the 1950s, 1960s and 1970s cohorts, respectively, and 46 in the earliest two cohorts and 30 in the latest cohort at the time of the third abortion (results not shown). The duration varied markedly by education. For instance, half of women with low education in the 1950s and the 1960s cohorts had their second abortion within about five years since the first one compared to eight or nine years among those with high education. The median durations since previous abortion were shorter for the 1970s cohort due to shorter exposure time, but educational differences were marked, and followed the same pattern as in the other cohorts.

On average, women had higher parity at the time of second and third abortions compared to first abortions, but the relationship varied by education: women with low education had higher parity at the time of abortion than women with at least middle level education. In the 1950s and 1960s cohorts, about half of the women with high education were married at the time of their first and second abortions, compared to 24 to 34 per cent of women with low education. Around a third of women were married at the time of their first and second abortions in the 1970s cohort compared to a fifth of women with low education. Women were on average older at the time of second and third abortions than first abortions, and similarly women with high education were older than women with low education, as one would expect (Table 4.3).

Table 4.3. Sample characteristics at the time of first, second and third abortion, weighted %, medians and means; unweighted N.

	Cohort	Education	N	Months since previous abortion (median)	Mean parity	% Married	Mean age
First abortions	**1955-59**	*Low*	9,718		1.05	32.7	26.7
		Middle	12,543		1.03	35.0	29.1
		High	1,015		1.24	54.1	34.2
	1965-69	*Low*	7,172		1.06	27.8	26.5
		Middle	16,126		0.80	23.7	27.7
		High	1,130		1.24	52.7	34.4
	1975-79	*Low*	4,410		0.89	21.5	24.3
		Middle	9,272		0.53	13.9	24.8
		High	1,245		0.66	36.5	29.1
Second abortions	**1955-59**	*Low*	3,196	56	1.39	33.9	28.6
		Middle	3,835	75	1.30	34.5	31.1
		High	212	105.5	1.26	47.6	34.6
	1965-69	*Low*	3,358	56	1.38	24.4	27.8
		Middle	5,050	70	1.15	24.5	29.9
		High	250	98.5	1.34	50.5	35.1
	1975-79	*Low*	2,011	38	1.18	18.6	25.0
		Middle	2,467	50	0.94	18.1	26.6
		High	233	54	0.89	34.1	29.6
Third abortions	**1955-59**	*Low*	892	39.5	1.63	32.6	30.4
		Middle	991	52	1.50	32.5	32.8
		High	36	73.5	1.09	30.3	36.6
	1965-69	*Low*	1,347	42	1.66	23.6	29.6
		Middle	1,497	50	1.41	23.7	31.8
		High	47	43	1.26	35.9	35.6
	1975-79	*Low*	804	30	1.46	17.5	26.3
		Middle	709	30	1.18	17.1	27.7
		High	46	40	1.06	24.5	30.2

Selected odds ratios of the multivariate analysis are shown in Table 4.4 (see Section 4.5 *Appendix* for full results). The crude odds ratios (not shown) were similar to the adjusted ones, apart from parity, for which the effect often reversed after controlling for age, mainly because the likelihood of abortion declines by age and childless women are typically younger than women with children.

Table 4.4. Selected odds ratios of second and third abortions by cohort.

		Cohort 1955-59[a]		**Cohort 1965-69**[a]		**Cohort 1975-79**[a]	
2nd abortions	**Education**	*Low*[b,c]	*High*[b,c]	*Low*[b,c]	*High*[b,c]	*Low*[b,c]	*High*[b,c]
Time since last abortion	*<6 months*	1.00	1.00	1.00	1.00	1.00	1.00
	6-12 months	1.19	1.07	3.07***	1.35	2.46***	1.40
	1-2 years	1.40**	1.10	3.31***	1.28	1.63***	0.72
	2-4 years	1.12	0.86	2.97***	1.07	1.34*	0.79
	4-6 years	0.83	0.93	2.34***	0.62	0.99	0.56
	6 or more years	0.55***	0.66	1.69**	0.68	0.67**	0.33***
Parity	*No children*	1.00	1.00	1.00	1.00	1.00	1.00
	1 child	1.48***	1.08	1.72***	0.99	1.64***	1.87***
	2 children	2.09***	1.15	2.12***	1.21	1.86***	2.24***
	3 or more	2.63***	1.39	2.75***	1.56	2.48***	3.44***
Union status	*Single*	1.00	1.00	1.00	1.00	1.00	1.00
	Married	0.58***	0.60**	0.43***	0.63*	0.51***	0.32***
	Cohabiting	n/a	n/a	0.56***	0.86	0.62***	0.36***
	Divorced	1.16*	1.50	0.87*	1.02	0.83	0.61
Age	*20-24*	1.00	1.00	1.00	n/a	1.00	n/a
	25-29	0.88*	1.81	0.85**	1.00	0.95	1.00
	30-34	0.76***	2.26	0.60***	1.53	0.49***	0.72*
	35-39	0.39***	1.94	0.35***	1.51	n/a	n/a
	40+	0.18***	0.80	0.090***	0.54	n/a	n/a
3rd Abortions	**Education**	*Low*[b]	*Mid-high*[b]	*Low*[b]	*Mid-high*[b]	*Low*[b]	*Mid-high*[b]
Time since last abortion	*<6 months*	1.00	1.00	1.00	1.00	1.00	1.00
	6-12 months	1.59*	1.70*	2.26***	1.71**	1.89***	2.09***
	1-2 years	2.08***	2.06**	2.48***	1.92***	1.22	1.57*
	2-4 years	1.48	1.61*	2.19***	1.49**	1.31	1.15
	4-6 years	0.98	1.19	1.67**	1.11	0.97	0.94
	6 or more years	0.65*	0.74	1.21	0.88	0.74	0.65*
Parity	*No children*	1.00	1.00	1.00	1.00	1.00	1.00
	1 child	1.52***	1.19	1.40***	1.41***	1.41***	1.35**
	2 children	1.63***	1.24*	1.64***	1.57***	1.98***	1.82***
	3 or more	1.94***	1.61***	1.74***	1.99***	2.04***	2.51***
Union status	*Single*	1.00	1.00	1.00	1.00	1.00	1.00
	Married	0.67***	0.65***	0.62***	0.47***	0.54***	0.39***
	Cohabiting	n/a	n/a	0.68***	0.54***	0.63***	0.51***
	Divorced	1.11	1.32**	1.12	1.05	1.12	0.95
Age	*20-24*	1.00	1.00	1.00	1.00	1.00	1.00
	25-29	0.93	1.17	1.01	1.20	1.01	0.94
	30-34	0.86	1.32*	0.80*	1.13	0.55***	0.57***
	35-39	0.62***	0.88	0.48***	0.72**	n/a	n/a
	40+	0.20***	0.43***	0.13***	0.19***	n/a	n/a

Notes: (a) Full results in appendix; (b) Controlling for the variables listed in the table, place of residence and nativity; (c) Results for Middle education not shown; * p<0.05, ** p<0.001, *** p<0.001, n/a=not applicable.

Table 4.4 shows that the likelihood of second abortion was positively associated with higher parity in all cohorts among women with lower and middle-level education. For instance, women with low education who had at least three children had approximately 2.5 times the odds of second abortion compared to otherwise similar women without children. Parity was not associated with the likelihood of second abortion among highly educated women in the 1950s and 1960s cohorts, but in the 1970s cohort women with three children and high education had 3.4 times the odds of abortion compared to childless women at that level of education. High parity was associated with higher likelihood of third abortion too, but the educational differences were smaller, particularly in the 1950s and 1960s cohorts.

Single, divorced or widowed women had higher likelihood of second abortion than married women in all cohorts. Although these differences were marked for women with low education, they were small for women with high education in the 1950s and 1960s cohorts. There was a negative association between age and the likelihood of second abortion among women with low education, but age was not associated with it among women with high education in the first two cohorts and had only a weak negative association in the 1970s cohort (Table 4.4).

The predicted probabilities in Figure 4.1 show that time since previous abortion was not strongly associated with the likelihood of second abortion among women with high education. Among women with low education the risk of second and third abortions peaked typically within a year or two since the previous abortion. The educational gap was markedly wider for later than for earlier cohorts and the absolute level of risk was much higher among women with low education in the latest cohort compared to women in this group of education in the earliest cohort.

I conducted sensitivity analyses including only women aged 20 to 31 in order to restrict the exposure time to be the same for all cohorts. These analyses showed the interpretation of the results remained essentially the same and the educational differentials remained more marked for the later than for the earlier cohorts. The risk of abortion peaked more clearly than in the models shown in Figure 4.1 for 1950s and 1960s cohorts, and the risk of abortion for women with high parity was slightly higher than in Table 4.4 (results not shown).

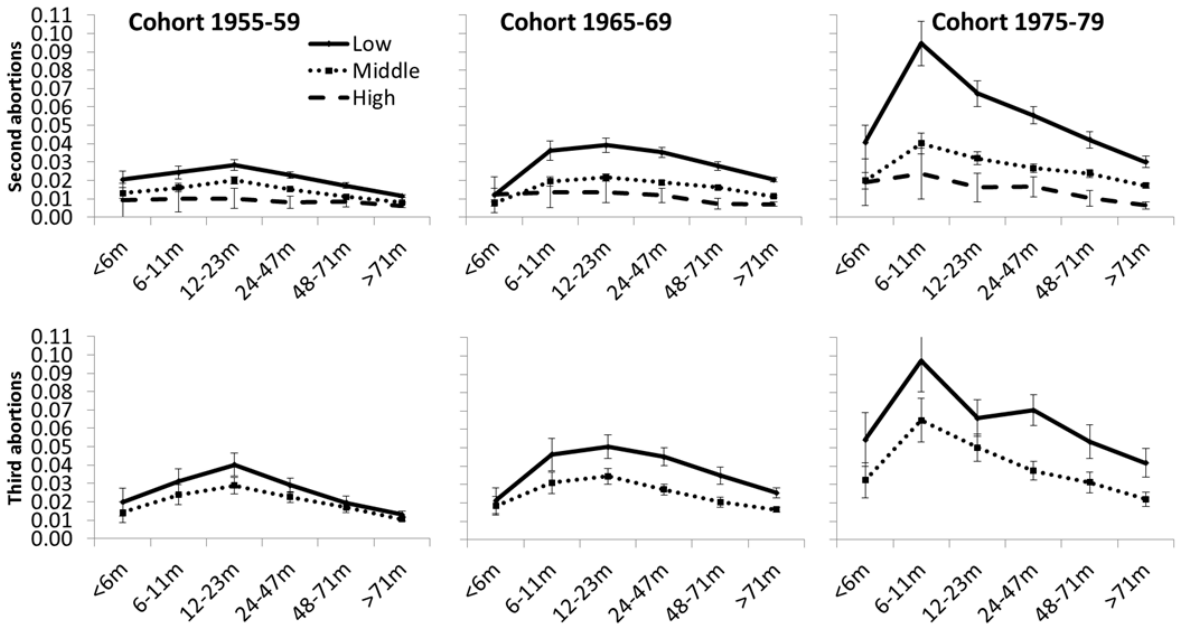


Figure 4.1. Predicted probabilities of second and third abortions by time since previous abortion, education (low, middle, high) and cohort, adjusted for age, union status, parity, place of residence and nativity.

4.4 Discussion

In this study I showed that the likelihood of repeat abortion was negatively associated with educational level and that these differences increased over time. These results add to the literature, since previous research on the topic has not used a high-quality large-scale dataset like the one in this study, and thus the results have been inconclusive. Some previous studies have found an association between low socioeconomic position and higher likelihood of repeat abortion (Das et al. 2009; Jones et al. 2006; Makenzius et al. 2011; Mentula et al. 2010; Väisänen and Jokela 2010), whereas others did not (Osler, David, and Morgall 1997). Given that underreporting of abortion is a common problem in all survey-based studies on abortion and that this problem is likely to be more severe for studies on repeat abortion (Jones and Kost 2007), this paper provides a crucial addition to the reproductive health literature.

The results of this study confirm that education is strongly associated with the likelihood of repeat abortion even in Finland, where a high proportion of the population has tertiary education (OECD 2010), family planning services are available in all municipalities (Hemminki et al. 1997), and the population is relatively homogenous in its ethnic composition. For instance, between 1980 and 2010 only up to five per cent of the population spoke other than one of the official languages (Finnish or Swedish) as their native language (Official Statistics of Finland 2013b). A concerning result was that the

educational inequalities in the likelihood changed from tiny in the 1950s cohort to clearly marked differences in the 1970s cohort. I have outlined possible reasons for these differences and means for a rapid intervention below.

The low likelihood of repeat abortion among highly educated women shows that it is possible to have relatively few women progress to their second or third abortion. The likelihood was largely independent of duration since last birth or abortion, relationship status, and parity. Among other educational groups these characteristics mattered more, which suggests that women with low and middle education more often use abortions to space and stop childbearing than women with high education. Perhaps women with high education benefit more from post-abortion contraceptive counselling than women with low education. This is supported by the finding that low educated women had high levels of risk shortly after previous abortion and that on average the interval between abortions was longer for those with high education.

Varying quality of family planning care may explain part of the educational differences. In the mid-1990s, women with high socioeconomic status were more likely to use private family planning services, and thus had shorter waiting periods before appointments and more often received care from a specialist than women who used public sector services (Hemminki et al. 1997), which may lead to a more timely and effective contraceptive use. Women with low education have lower income than women with high education. Therefore, they may not have timely access to family planning services due to high out-of-pocket costs in private clinics and long waiting times in public clinics. Lack of knowledge of these services may also explain a part of the educational differences. New studies on the topic are needed to confirm this. In the meantime, creating high-quality family planning services easily accessible for all women is likely to be helpful in reducing the educational inequalities in the likelihood of repeat abortion.

Although the price of most commonly used contraceptives is less than one per cent of annual mean income of Finnish women (Koistinen 2008; Official Statistics of Finland 2013c; University Pharmacy 2014; Väestöliitto - Family Federation of Finland 2012; also see section 1.4.3 for more information on the costs of contraceptives), the poorest women may struggle to pay for contraceptives. In addition, some municipalities introduced small fees for family planning service use in the 1990s (Kosunen 2000), which may have impacted predominantly the poorest women. In France free contraceptives reduced the likelihood of repeat abortion particularly among those with low income

(Alouini et al. 2002). Providing free contraceptives is thus one possible intervention for reducing educational differences in unintended pregnancy and repeat abortion. Studies in many countries have found that promoting use of long-acting reversible contraception, such as IUDs or contraceptive implants, might be the most effective way forward (Ames and Norman 2012; Heikinheimo, Gissler, and Suhonen 2008; Pohjoranta et al. 2015; Rose and Lawton 2012).

The increase in the educational differences in later cohorts compared to the earlier ones was probably in part due to selection into education. Although it was still fairly common to have low education in the 1950s cohort, it became increasingly unusual in the later cohorts as shown in Table 4.1. Thus, women with low education have probably become a selected group, different from other women in other characteristics as well, which may partly explain why these women more often have repeat abortions than others. A possible explanation for the observed pattern could be that as having low education becomes less common, those without a graduate degree may have to accept less attractive jobs than those in earlier cohorts when it was more common (Breen et al. 2009), leading to lower income and a more precarious position in the labour market. They differ from those with higher socioeconomic position in aspects of health too, as shown by mortality differences by socioeconomic status, which have increased in the past decades in Finland (Mackenbach et al. 2003; Shkolnikov et al. 2012). Therefore, the higher incidence of repeat abortion needs to be interpreted within the wider context of the lives of these women. They may not have the same resources as other women to access family planning or other health-care services, or use contraceptives consistently and efficiently. However, more research is needed to confirm whether this is the mechanism.

There were limitations in this study due to lack of information on variables not included in population registers and lack of detail due to ethics regulations. For instance, valuable information could have been gained by comparing women with repeat unintended births to women with repeat abortions, but pregnancy intentions were not known. Moreover, there was no information on contraceptive use although that is associated with likelihood of abortion. Another limitation is that some of the abortions that were classified as first abortions in this study may have been repeat abortions, if the woman had terminated an earlier pregnancy abroad. On the other hand, some repeat abortions may have not been observed, if the operation took place outside Finland. Unfortunately, no information on terminations abroad were available in my dataset.

However, I do not expect that to have a major impact on the results, as the proportion of immigrant women was relatively low. Moreover, these data on repeat abortion are more reliable than any survey data on abortion regardless of these potential sources of missing data (Jones and Kost 2007).

Despite the limitations, the results are robust due to reliability of register data and they provide new information. These results are of interest to researchers and policy-makers in countries like Finland where family planning services do not receive enough attention due to low average fertility and abortion levels. Inequalities in levels of unintended pregnancy are the key for understanding why some women have to rely on abortion more often than others.

4.5 Appendix

Appendix Table 4.1 Odds ratios of second abortion by cohort, standard errors in parentheses

Cohort 1955-59	**Education:**	**Low**		**Middle**		**High**	
Variable	*Category*	OR	S.E.	OR	S.E.	OR	S.E.
Time since abortion	*<6 months*	1.00		1.00		1.00	
	6-12 months	1.19	(0.16)	1.24	(0.18)	1.07	(0.68)
	1-2 years	1.40**	(0.17)	1.56***	(0.20)	1.10	(0.63)
	2-4 years	1.12	(0.13)	1.17	(0.15)	0.86	(0.47)
	4-6 years	0.83	(0.10)	0.85	(0.11)	0.93	(0.51)
	6 or more years	0.55***	(0.07)	0.62***	(0.07)	0.66	(0.34)
Parity	*No children*	1.00		1.00		1.00	
	1 child	1.48***	(0.08)	1.23***	(0.06)	1.08	(0.20)
	2 children	2.09***	(0.13)	1.63***	(0.09)	1.15	(0.24)
	3 or more	2.63***	(0.19)	2.05***	(0.13)	1.39	(0.33)
Union status	*Single*	1.00		1.00		1.00	
	Married	0.58***	(0.03)	0.49***	(0.02)	0.60**	(0.10)
	Divorced	1.16*	(0.07)	1.30***	(0.07)	1.50	(0.35)
Age	*20-24*	1.00		1.00		1.00	
	25-29	0.88*	(0.05)	1.01	(0.05)	1.81	(1.86)
	30-34	0.76***	(0.05)	0.96	(0.06)	2.26	(2.33)
	35-39	0.39***	(0.03)	0.66***	(0.04)	1.94	(2.00)
	40 or more	0.18***	(0.02)	0.26***	(0.02)	0.80	(0.83)
Cohort 1965-69		**OR**	**S.E.**	**OR**	**S.E.**	**OR**	**S.E.**
Time since abortion	*<6 months*	1.00		1.00		1.00	
	6-12 months	3.07***	(0.54)	2.56***	(0.36)	1.12	(0.58)
	1-2 years	3.34***	(0.55)	2.86***	(0.38)	1.10	(0.52)
	2-4 years	2.99***	(0.48)	2.49***	(0.32)	0.95	(0.42)
	4-6 years	2.36***	(0.39)	2.12***	(0.28)	0.58	(0.27)
	6 or more years	1.68**	(0.27)	1.45**	(0.19)	0.56	(0.24)
Parity	*No children*	1.00		1.00		1.00	
	1 child	1.73***	(0.09)	1.51***	(0.06)	1.06	(0.20)
	2 children	2.12***	(0.12)	1.97***	(0.09)	1.23	(0.25)
	3 or more	2.76***	(0.19)	2.44***	(0.14)	1.41	(0.35)
Union status	*Single*	1.00		1.00		1.00	
	Married	0.43***	(0.02)	0.33***	(0.02)	0.60*	(0.12)
	Cohabiting	0.56***	(0.03)	0.50***	(0.02)	0.88	(0.19)
	Divorced	0.88*	(0.06)	0.91	(0.05)	0.88	(0.25)
Age	*20-24*	1.00		1.00			
	25-29	0.86**	(0.04)	0.99	(0.04)	1.00	
	30-34	0.61***	(0.04)	0.85**	(0.04)	1.57	(0.45)
	35-39	0.35***	(0.03)	0.60***	(0.03)	1.59	(0.47)
	40 or more	0.12***	(0.01)	0.23***	(0.02)	0.72	(0.25)

(Appendix Table 4.1 cont.)

Cohort 1975-79		**OR**	**S.E.**	**OR**	**S.E.**	**OR**	**S.E.**
Time since abortion	*<6 months*	1.00		1.00		1.00	
	6-12 months	2.46***	(0.34)	2.18***	(0.29)	1.40	(0.54)
	1-2 years	1.63***	(0.21)	1.67***	(0.21)	0.72	(0.26)
	2-4 years	1.34*	(0.17)	1.38**	(0.17)	0.79	(0.26)
	4-6 years	0.99	(0.13)	1.23	(0.15)	0.56	(0.19)
	6 or more years	0.67**	(0.09)	0.85	(0.10)	0.33***	(0.10)
Parity	*No children*	1.00		1.00		1.00	
	1	1.64***	(0.10)	1.81***	(0.10)	1.87***	(0.34)
	2	1.86***	(0.13)	2.66***	(0.17)	2.24***	(0.49)
	3 or more	2.48***	(0.21)	3.14***	(0.28)	3.44***	(1.08)
Union status	*Single*	1.00		1.00		1.00	
	Married	0.51***	(0.04)	0.37***	(0.02)	0.32***	(0.06)
	Cohabiting	0.62***	(0.04)	0.51***	(0.03)	0.36***	(0.07)
	Divorced	0.83	(0.08)	1.05	(0.10)	0.61	(0.21)
Age	*20-24*	1.00		1.00			
	25-29	0.95	(0.06)	1.02	(0.06)	1.00	
	30 or more	0.49***	(0.04)	0.61***	(0.04)	0.72*	(0.11)

Notes: Controlling for the variables listed in the table, place of residence and nativity; Only women who had at least one abortion included.
* p<0.05, ** p<0.001, *** p<0.001

Appendix Table 4.2. Odds ratios of third abortion by cohort, standard errors in parentheses.

Cohort 1955-59	**Education:**	**Low**		**Middle or high**	
Variable	*Category*	OR	S.E.	OR	S.E.
Time since abortion	*<6 months*	1.00		1.00	
	6-12 months	1.59*	(0.37)	1.70*	(0.41)
	1-2 years	2.08***	(0.45)	2.06**	(0.46)
	2-4 years	1.48	(0.31)	1.61*	(0.35)
	4-6 years	0.98	(0.22)	1.19	(0.26)
	6 or more years	0.65*	(0.14)	0.74	(0.16)
Parity	*No children*	1.00		1.00	
	1	1.52***	(0.16)	1.19	(0.11)
	2	1.63***	(0.19)	1.24*	(0.13)
	3 or more	1.94***	(0.25)	1.61***	(0.18)
Union status	*Single*	1.00		1.00	
	Married	0.67***	(0.06)	0.65***	(0.05)
	Divorced	1.11	(0.12)	1.32**	(0.12)
Age	*20-24*	1.00		1.00	
	25-29	0.93	(0.10)	1.17	(0.17)
	30-34	0.86	(0.10)	1.32*	(0.19)
	35-39	0.62***	(0.08)	0.88	(0.13)
	40 or more	0.20***	(0.04)	0.43***	(0.07)
Cohort 1965-69		**OR**	**S.E.**	**OR**	**S.E.**
Time since abortion	*<6 months*	1.00		1.00	
	6-12 months	2.31***	(0.45)	1.73**	(0.30)
	1-2 years	2.50***	(0.46)	1.90***	(0.30)
	2-4 years	2.22***	(0.40)	1.48*	(0.23)
	4-6 years	1.72**	(0.32)	1.09	(0.17)
	6 or more years	1.19	(0.22)	0.87	(0.13)
Parity	*No children*	1.00		1.00	
	1	1.41***	(0.12)	1.40***	(0.10)
	2	1.64***	(0.15)	1.58***	(0.13)
	3 or more	1.79***	(0.18)	2.01***	(0.18)
Union status	*Single*	1.00		1.00	
	Married	0.63***	(0.05)	0.46***	(0.03)
	Cohabiting	0.67***	(0.05)	0.57***	(0.04)
	Divorced	1.13	(0.10)	1.05	(0.09)
Age	*20-24*	1.00		1.00	
	25-29	1.01	(0.09)	1.21	(0.13)
	30-34	0.80*	(0.08)	1.14	(0.12)
	35-39	0.48***	(0.05)	0.72**	(0.08)
	40 or more	0.17***	(0.03)	0.25***	(0.04)

(Appendix Table 4.2 cont.)

Cohort 1975-79		**OR**	**S.E.**	**OR**	**S.E.**
Time since abortion	*<6 months*	1.00		1.00	
	6-12 months	1.89***	(0.33)	2.09***	(0.39)
	1-2 years	1.22	(0.20)	1.57*	(0.27)
	2-4 years	1.31	(0.21)	1.15	(0.20)
	4-6 years	0.97	(0.17)	0.94	(0.17)
	6 or more years	0.74	(0.13)	0.65*	(0.12)
Parity	*No children*	1.00		1.00	
	1	1.41***	(0.15)	1.35**	(0.13)
	2	1.98***	(0.22)	1.82***	(0.19)
	3 or more	2.04***	(0.27)	2.51***	(0.34)
Union status	*Single*	1.00		1.00	
	Married	0.54***	(0.06)	0.39***	(0.04)
	Cohabiting	0.63***	(0.06)	0.51***	(0.05)
	Divorced	1.12	(0.14)	0.95	(0.14)
Age	*20-24*	1.00		1.00	
	25-29	1.01	(0.09)	0.94	(0.10)
	30 or more	0.55***	(0.07)	0.57***	(0.07)

Notes: Controlling for the variables listed in the table, place of residence and nativity; Only women who had at least two abortions included.
* p<0.05, ** p<0.001, *** p<0.001

5. Timing of abortions, births and relationship transitions in Finland[16]

Abstract

OBJECTIVE

Studies have shown union dissolution and fertility decisions influence each other, but there is no research taking abortion decisions into account although relationship problems are common reasons for abortion. I study how decisions to terminate a pregnancy are intertwined with the decisions to end a romantic relationship and with childbearing.

METHODS

I used multi-level multi-process event-history modelling to analyse longitudinal Finnish register data of women born in 1965–69.

RESULTS

There were unobserved characteristics affecting both union stability and the likelihood of an abortion. Women with a tendency towards less stable unions also had a higher likelihood of abortion. A strong positive association between experiencing an abortion and union dissolution within the same year was found. This effect was less strong for cohabiting than married couples, as was the negative association between a conception leading to birth and a union dissolution within the same year. Relationship situation was an important factor in determining the likelihood of experiencing a birth or an abortion.

CONCLUSIONS

Tendency towards unstable unions is perhaps associated with abortion as women whose suspect their union will dissolve may wish to avoid childbearing. Tendency towards unstable unions was not associated with higher fertility implying commitment effect increasing the fertility of those experiencing many unions was not strong. The effects were different for married and cohabiting women, particularly in early years of the relationship, implying for instance a different level of commitment.

CONTRIBUTION

This study is the first to show how these processes are intertwined using reliable data.

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

[16] A shorter version of this paper will be submitted to a peer-reviewed journal.

5.1 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 considering one or the other of these processes alone may lead to biased results, as these decision-making processes are correlated. In other words, people make childbearing decisions together with decisions to continue or to leave a romantic relationship. The statistical implication of this correlation is that the processes should be modelled simultaneously (I will return to this issue below). Due to lack of suitable data, these studies were not able to take pregnancies that did not lead to childbearing into account although, as stated by Leone and Hinde (2007), it would have provided more information about the dynamics of union dissolution and fertility behaviour. For example, the DHS calendar data used in the study by Leone and Hinde (2007) does not distinguish between abortions and miscarriages, whereas the National Child Development Study used in the study by Steele and colleagues (2005) suffers from severe underreporting of abortion: it has been estimated that only a half of abortions were reported in those data (Berrington 2001). In fact, any survey is likely to suffer from severe underreporting of abortions (Jones and Kost 2007). Not being able to take pregnancy termination into account is a limitation in these earlier studies. It seems likely that decisions to terminate a pregnancy are associated with union instability, as relationship problems are among the most often cited 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 study aims to fill in this gap in the literature by using longitudinal data from Finnish population registers to study whether the decisions to terminate a pregnancy, to end a romantic relationship and timing of childbearing influence each other. Therefore, the focus is on the likelihood of having an abortion during a marital or cohabiting union and the proximity of union dissolution (which is interpreted as an indicator of a period of difficulties in the relationship preceding it) and the abortion decision, while taking into account timing of childbearing. Although it would be interesting to also examine the situations in which single women are more likely to terminate a pregnancy that is outside the scope of this study. The advantages of using register data rather than survey data are overcoming the problems of underreporting of abortion, left censoring of union histories, that is, not knowing when a union started, which may pose methodological problems

(Leone and Hinde 2007), and attrition over long follow-up times, which is common in longitudinal studies. Finally, unlike in many other countries (Hovde Lyngstad and Skardhamar 2011), in Finland information on cohabitation has been included in the administrative registers since 1987, enabling an examination of whether the decision to terminate a pregnancy depends on being in a cohabiting union or married. To the best of my knowledge, this is the first study to analyse simultaneously the processes leading to births, abortions, and union dissolutions using reliable longitudinal data on these events.

5.2 Previous studies

5.2.1 Births and union dissolutions

As previous studies that examined pregnancies and relationship events simultaneously focused on union transitions and childbearing (Aassve et al. 2006; Leone and Hinde 2007; Lillard 1993; Lillard and Waite 1993; Steele et al. 2005), I begin with summarising those results and the likely mechanisms behind the findings. I also briefly discuss how fertility decision-making may differ depending on whether the women are cohabitating or married (e.g. Steele et al. 2005).

Childbearing and union dissolution decisions can be intertwined in different ways depending on the culture around romantic relationships and childbearing in the population of interest. For instance, Lillard and Waite (1993) theorised that in the United States having children increases the costs of a break-up, and thus couples who suspect their marriage may end soon do not wish to start childbearing, whereas those who are committed to their relationship are more likely to have children. However, in Brazil women with low education and in consensual unions, which typically are less stable than marriages, may think childbearing decreases the chances of the union dissolving and thus want to start childbearing early in the relationship (Leone and Hinde 2007). In the United Kingdom, childbearing stabilised relationships, but the effect was weaker for cohabiting than for married couples (Steele et al. 2005), indicating that these processes may be differently intertwined depending on the type of union the women are in.

The decision to have children may be different in cohabiting unions and marriages. The level of commitment of the couple may differ in marital and cohabiting relationships in particular in the early stages of the relationship (Perelli-Harris 2014). The level of commitment in turn is associated with childbearing intentions (Leone and Hinde 2007; Lillard and Waite 1993). Again, whether women see cohabitation as a good setting

for childbearing depends not only on their personal characteristics but also on the culture of the country they live in. Focus groups conducted in eight European countries regarding the meaning of cohabitation showed that although cohabitation has become more popular everywhere 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 and preserving one's 'freedom', whereas in Norway few differences between cohabitation and marriage were found (Lappegård and Noack 2015; Perelli-Harris et al. 2014). In Norway, having a child together was more important in defining a couple than being married, and cohabitation was seen as a good setting for childbearing (Lappegård and Noack 2015). In most countries of the study, the first stages of cohabitation were seen as a minor step beyond dating (Perelli-Harris et al. 2014). Long-term cohabiting unions often become more like marriages. The couple may buy property, join finances, and have children together, which increases their commitment to each other (Hoem, Jalovaara, and Muresan 2013; Holland 2011; Lyngstad, Noack, and Tufte 2011). In Finland, the proportion of births to unmarried women increased from six to 41 percent between 1970 and 2010 (Official Statistics of Finland 2012). The vast majority of these non-marital births occurred within cohabiting unions (Hoem, Jalovaara, and Muresan 2013), indicating that attitudes towards cohabitation may be similar to what was reported in Norway by Lappegård and Noack (2015).

5.2.2 Abortions and union dissolutions

I expect that decisions regarding pregnancy termination and union transitions influence each other, because relationship problems are among the most commonly cited reasons for an abortion (Bankole, Singh, and Haas 1998; Chibber et al. 2014; Finer et al. 2005; Kirkman et al. 2009). Almost four in ten women seeking abortions in the United States reported relationship problems as the reason for terminating the pregnancy, including one in ten women stating their relationship may break up soon (Finer et al. 2005). Women may choose to terminate their pregnancy if they perceive their relationship to be too problematic, new or unstable; their partner is mentally or physically abusive; or they perceive him as not suitable or willing to be a father (Chibber et al. 2014; Kirkman et al. 2009). Mauldon and colleagues (2015) showed that less than 40 per cent 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. 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). These results indicate abortions do not cause union dissolutions and that giving birth only postpones the union dissolution if there were problems in the relationship to begin with. Women may choose an abortion after a union dissolution, or if it seems likely that their union will dissolve soon, due to concerns about not having enough economic or other resources to take care of the child without a partner (Finer et al. 2005).

As outlined in section *5.2.1 Births and union dissolutions*, decisions of childbearing and union dissolutions seem to be differently intertwined depending on whether a woman is cohabiting or married at least in the early stages of the union. It may be the case for abortions too. Women may feel differently about an unintended pregnancy depending on whether they are married or cohabiting assuming that there are differences in the level of commitment between marriages and cohabitations in the early stages of the union, as suggested by Perelli-Harris and colleagues (2014), one would expect the likelihood of abortion to be higher early in a cohabiting union than in early marriage, but to decrease over time, when cohabiting unions tend to become more similar to marriages due to shared property, finances and children (Hoem, Jalovaara, and Muresan 2013; Holland 2011; Lyngstad, Noack, and Tufte 2011).

5.2.3 Abortions and previous births

The decision to continue or terminate a pregnancy also depends on timing of births. 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). Therefore, women may wish to postpone (or avoid) entry into parenthood by obtaining an abortion if they became pregnant unintentionally.

A commonly cited reason for abortion is not wanting to have any more children, which indicates using abortion to stop childbearing (Bankole, Singh, and Haas 1998; Finer et al. 2005; Kirkman et al. 2009). Some women report concern of negative implications on existing children as a reason of abortion: they were worried about the new

child depriving existing children of parental and economic resources (Finer et al. 2005; Kirkman et al. 2009).

Sometimes women may seek an abortion because a new pregnancy started too soon after giving birth, which is a sign of using abortion to space births. It has been shown that abortions soon (up to 18 months) after births are relatively common in Finland (Vikat, Kosunen, and Rimpela 2002), perhaps due to a combination of a desire for a longer birth interval, or a desire to stop childbearing, together with ineffective contraception use after birth. It may also be that these women were concerned about not having enough economic or parental resources to take care of a new child so soon after their previous child was born (Finer et al. 2005; Kirkman et al. 2009).

5.2.4 Other determinants of abortions, births and union dissolutions

Studies in Finland and other Nordic countries have shown socioeconomic characteristics 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) and union formation patterns (Jalovaara 2012). Aassve and colleagues (2006) examined employment transitions simultaneously with union transitions and births and showed that these decisions were intertwined. Unfortunately employment transitions were not measured in enough detail in my data (see section 2.1.2 for more information) to do that in my study. I did, however, control for these types of variables in this study.

5.2.5 Finnish context

See section 1.4 for more information on the relevant Finnish context.

5.2.6 Aim of the study

My aim is to examine how the process of having an abortion is intertwined with births and union dissolutions using nationally representative data of a cohort of Finnish women born in 1965–69. 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 focus on union dissolutions in this study. I do not include other types of union transitions, such as translating cohabitation into marriage, because the focus of this study is in understanding in which situations in life women have induced abortions. Pregnancy terminations often happen during times when women are experiencing problems in their romantic relationships (Bankole, Singh, and Haas 1998; Finer et al. 2005), whereas events such as converting cohabitation into marriage are likely to be associated with pregnancies leading to childbirth (Steele et al. 2005) and thus it seems reasonable to assume that union dissolution is the most important type of union transition when it comes to abortions. Almost six percent of conceptions leading to abortion in this study took place in the same year as union dissolution, compared to less than two percent of conceptions leading to births. Including other types of transitions would increase the complexity of the models greatly, making it challenging to interpret and conduct the analyses, and the time needed for the models to run before reliable results could be obtained would increase greatly (see also Steele et al. 2005).

5.3 Data

The dataset I used in this study has been described in section *2.1.2 Data of the Study*. I only study the cohort of women born in 1965–69 due to two reasons. First, as information on cohabitation has been included in the Finnish population registers since 1987, but not at all before that, these women were young enough to have (almost) all of their cohabitations recorded. Second, they were old enough in 2010, when data collection for this study ended, to have experienced a sufficient number of abortions, births, and union dissolutions to make the analyses possible.

I extracted these 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 women born in the years 1965–69 in Finland[17]. The resampled dataset

[17] Originally, the data included an oversample of women who had ever had an abortion. This sampling strategy required using weights when analysing these data statistically. As the methods and software used in this study are more readily available when not using weights, I conducted resampling, making the sample a simple probability sample. Based on unpublished data provided by Statistics Finland about the sampling frame for this dataset, the number of women who had had an abortion was reduced until everyone in the total population had the same probability to have been selected. I selected those excluded from the dataset randomly.

included 19,166 women instead of 101,291 in the original dataset. I reduced the number of women included in the analyses in order to make it possible to conduct the analysis using complex multi-level multi-process discrete-time event-history models, as these models are time consuming to run for large datasets (see section 2.2.2 for more information). Finally, I excluded non-native Finns from the study in order to exclude women who entered the study after age 15 (the start of the observation period) in order to avoid left censoring of union and pregnancy histories, that is, to exclude those for whom complete union and pregnancy histories were not observed because they only moved to Finland after the age of 15. There were 17,666 women in the final analytical sample. As the dataset is still large and there are a large number of abortions (N=5,839), births (N=32,020) and union dissolutions (N=13,771) observed, I do not expect the resampling to affect the reliability and robustness of the results. Moreover, descriptive analyses and single-level regression models conducted to both samples showed very similar results (available on request).

5.3.1 Union status and related variables

I defined anyone who was cohabiting or married as being 'in union' or 'in relationship' (used interchangeably in this paper). Statistics Finland's classification of marital status is based on the official marital status, regardless of whom the woman lives with. Thus, I cannot differentiate between married women who are living with their spouse and women who have already separated from their spouse but have not (yet) obtained a divorce. In my dataset, relationship status (marital status and cohabitation) was recorded on the last day of each year. As I did not have information about the exact timing of relationship transitions, I assumed that the relationship status of each woman stayed constant throughout each calendar year. If a woman transitioned from cohabitation to marriage without living alone in between, I assumed this happened with the same partner. Similarly, I assumed any consistent period of cohabitation (or marriage) happened with the same partner, although sometimes people may move in directly with their new partner after their previous relationship ends. I had to make these assumptions, no information of the partner's identity or characteristics was included in my dataset. I defined union dissolution as transitioning from cohabitation to single, from married to cohabitation, or from married to divorced or widowed.

5.3.2 Pregnancy outcomes and related variables

The month and year of all births and abortions were recorded in the dataset. Birth refers to a live birth and abortion to an induced abortion; stillbirths or miscarriages were not included in the dataset. I calculated the age of the youngest child based on time since last live birth. I calculated 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 three years, one child aged three or more years, two or more children of whom youngest is aged less than three years, and two or more children of whom youngest is aged three or more years. Preliminary analyses (using the iterative least squares (IGLS) method, see more information in sections 2.2.2 and 5.4) 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 three years as the cut-off point to differentiate between families with at least one toddler and those with older children (or no children). Age three is important in the Finnish context for fertility decisions, as a parent is allowed to stay home taking care of children without losing his or her job until the youngest child of the family is three years old (Vikat 2004). That may increase the incentive to have a subsequent child within three years from the previous birth. I also conducted initial analyses, where the cut-off point was 18 months of age, as it has been shown that in Finland the risk of abortion is high up to 18 months after birth (Vikat, Kosunen, and Rimpela 2002), but as the interpretation of the results was similar in both cases, I chose the cut-off of three years.

5.3.3 Other socio-demographic characteristics included in the models

Age was measured based on the women's year of birth, as their exact date of birth was not known. Education included three categories: low, middle and high. See section 2.1.2 for more information on the variables. In some analyses I used education as a binary variable: low education versus middle and high education to ease model convergence. Parents' occupational category was measured in four categories: upper- and lower-level employee, manual and other, where upper-level employee was regarded as the highest status followed by lower-level employees and manual workers, respectively. The 'other' category consists of farmers, pensioners, students and entrepreneurs and is thus difficult to fit into the hierarchical order.

5.4 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 observed or unobserved characteristics impacting a woman's likelihood to have an abortion, a birth or union dissolution. 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 decisions to continue or terminate a pregnancy are made jointly with decisions regarding union dissolution, 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 (see Steele et al. 2005). Thus, I estimated three equations–one for each outcome of interest (conception leading to abortion, conception leading to birth, and union dissolution)–simultaneously using multi-process modelling, which allows the woman-level random effects specified in the respective multi-level models to correlate freely across equations. If these random effects were correlated, it shows pregnancy decision-making is endogenous with respect to union dissolutions (Steele et al. 2005).

I analysed these data using discrete-time event-history models. As relationship transitions were only measured once a year and births and abortions monthly, it was more natural to specify a discrete-time than a continuous-time event-history model. The loss of information compared to continuous-time models is minimal, because most covariate values are constant throughout each year and thus it was necessary to assume that the hazard function was also constant during that period of time. The other advantage of discrete-time models is that standard statistical packages for logistic regression modelling can be used (Steele et al. 2005). Thus, I specified a multi-level multi-process discrete-time event-history model. Multi-level multi-process modelling of continuous-time event-history models was first outlined by Lillard (1993), but other scholars have applied these models to discrete-time event-history models since (Steele et al. 2005; Steele, Goldstein, and Browne 2004).

Identification of simultaneous equations typically require covariate exclusions (Steele et al. 2005). This means including parameters in one model that are not included in the other. These variables should be correlated with one of the outcomes, but not at all with the other. Typically, such variables are difficult to find. However, this is not a problem, if the model is fitted under the assumption (as mine were) that the residual dependence between processes is accounted for by allowing cross-process correlation of the individual-level residuals which were constant over time for the same individual (Lillard, Brien, and Waite 1995; Steele et al. 2005; Upchurch, Lillard, and Panis 2002). Despite the assumption, I included covariates in the birth outcomes model that were not included in the union dissolution model (see section *5.5 Analytical strategy*), and fitted a reciprocal model, where the outcomes of each process (i.e. the time-varying indicators of union dissolution and conceptions leading to a birth or an abortion, see section *5.5 Analytical strategy* for more information) were included as explanatory variables in the model for the other process.

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. In other words, 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 changes that are due those (such as pregnancy intentions changing after a birth of a child) (Steele et al. 2005).

I conducted the analyses in MLwiN (Rasbash et al. 2009) through the *runmlwin* command in Stata 14 (Leckie and Charlton 2013). I applied Bayesian estimation using the Markov chain Monte Carlo (MCMC) method in estimating the models (see e.g. Browne 2009), because it has been shown that the alternative iterative generalised least squares (IGLS) models are often biased when the response variable is binary (Leckie and Charlton 2013). I initially explored the models using the first order marginal quasi-likelihood method—one of the IGLS methods (Leckie and Charlton 2013)—and used these results as starting values for MCMC.

I used 10,000 iterations in the burn-in period, which is meant to stabilise the chains before starting the actual iteration process of 100,000 rounds of iterations (Browne 2009). 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 assess whether the chains had converged. These diagnostics are reported in section *5.8 Appendix* (also see Section 2.2.2 for more information on the relevant diagnostics).

5.5 Analytical strategy

I measured the duration of time in birth and abortion models as years since age 15 until the estimated age at conception of the first pregnancy and as years since the end of last pregnancy after that. I assumed the time of conception was three months before an abortion and nine months before a birth. As the length of gestation was not recorded in my dataset, I had to make this assumption. As timing of abortions and births were measured at monthly intervals, I divided the duration at the risk of event (conception) during each one year interval by the number of months the woman was at risk of the event during each year to prevent loss of information compared to having used monthly intervals. The variable measuring duration of time in the union dissolution analyses was years spent in each union.

Each union as well as the intervals from age 15 to first birth (abortion) and each birth (abortion) interval thereafter form a period of time called an 'episode'. A new episode started two months after the end of each pregnancy as that was the shortest duration between an end and a start of a pregnancy in the dataset. I defined indicators for the outcomes of interest: union dissolution, (a conception leading to) abortion or birth, and interacted these with the duration variables and the covariates when specifying the multi-process model (see Steele et al. 2005).

5.5.1 The hazard of pregnancy outcomes

A competing risks model can be specified either using a multinomial logit model or multivariate binary response model. As fitting a multi-process model in MLwiN is more straightforward when the all outcome variables are of the same format, the competing risks model for pregnancy outcomes consists of two logistic regression models with correlated random effects (the hazard of union dissolution will also be estimated using a multi-level logistic model). Fitting all models as binary logistic regression models also means that the results can be interpreted conveniently as odds ratios.

The model for the hazard of abortion was chosen based on preliminary IGLS analyses and it included the variables described in the section *5.3 Data*. I included all pregnancies, regardless of whether they happened during a relationship, in this model. The model can be written as follows (omitting the subscripts for women and episodes):

$$logit\left(h_t^{ab}\right) = \beta_0^{ab} + \beta_1^{ab} D_t^{ab} + \beta_2^{ab} A_t^{ab} + \beta_3^{ab} L_t^{ab} + \beta_4^{ab} T_t^{ab} + \beta_5^{ab} L_t^{ab} * T_t^{ab} + \beta_6^{ab} C_t^{ab} + \beta_7^{ab} PA_t^{ab} + \beta_8^{ab} UD_t^{ab} + \boldsymbol{\beta}_9^{ab} \boldsymbol{X}_t^{ab} + u^{ab} \quad (5.1)$$

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 (centred around the grand mean); L_t^{ab} is the length of the current union in years; T_t^{ab} is type of union (marriage or cohabitation); $L_t^{ab} * T_t^{ab}$ 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 an indicator of the woman having had a previous abortion; UD_t^{ab} is an indicator telling whether a union dissolution took place within the year of interest; $\boldsymbol{X}_t^{ab}$ 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. I included an interaction term between the type and length of union, because the hazard of an abortion might differ depending on these characteristics.

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

5.5.2 The hazard of union dissolution

I modelled the equation for the hazard of union dissolution first in a single-process multi-level model, then simultaneously with the competing risks model of pregnancy outcomes. I did not consider cohabitation as a different 'state' from marriage. In other words it is not represented by its own equation in order to reduce the complexity of the model. Instead, I combined cohabitations and marriages into one 'union' state and included a time-varying indicator of whether a woman's current union was cohabitation or marriage in the models. It was interacted with relevant variables, thus allowing the results to differ

depending on the type of union the women were in. The equation for the union dissolution model can be written as follows (omitting the subscripts for women and episodes):

$$\begin{aligned} logit\left(h_t^d\right) = {} & \alpha_0 + \alpha_1 L_t + \alpha_2 T_t + \alpha_3 L_t * T_t + \alpha_4 AB_t + \alpha_6 CB_t * T_t \\ & + \alpha_7 AB_t * T_t + \alpha_8 CB_t + \alpha_9 AU_t + \alpha_{10} C_t + \alpha_{11} P_t + \alpha_{12} PA_t \\ & + \boldsymbol{\alpha}_{13} \boldsymbol{X}_t + u^d \end{aligned} \qquad (5.2)$$

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^d is type of union (marriage or cohabitation); 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); AB_t^d is an indicator of having had an abortion within the calendar year of interest and CB_t^d of having had a birth within the calendar year; PA_t^d is an indicator of the woman having ever had a previous abortion; $\boldsymbol{X}_t^d$ 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. The hazard of a union dissolution might differ depending on the type and length of the union. Thus, I included an interaction term between the two. I also specified an interaction between the type of union and pregnancy outcome to investigate whether experiencing an abortion or a birth has a different association with the hazard of union dissolution in marital and cohabiting unions.

5.5.3 The joint three-process model of all outcomes

I show two types of models in the results section. First, I 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 where the woman-level random effects were allowed to correlate freely. 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 0.

Since union transitions were only measured once a year in my dataset, I did not know which happened first: abortion/birth or union dissolution if the events were recorded in the same year. Not knowing when exactly these decisions were made is a

shortcoming of register data and should be kept in mind when interpreting the results of the study.

5.6 Results

5.6.1 Descriptive statistics

Table 5.1 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). If a union was transformed from cohabitation to marriage, in half of the cases (49 per cent) this happened 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 5.1 also shows that 23 per cent of the women in the sample 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 per cent had not completed at least middle level education. This is probably because many women obtained abortions when they were relatively young, and they only completed their education after the event. Around 37 per cent of women were in union at the time of abortion, whereas more than 90 per cent of births happened during a union. Four in ten women came from manual worker backgrounds, whereas only 13 per cent came from the highest parental socioeconomic background of upper-level employees.

Table 5.1. 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**
Age	28.9 (0.01)	25.8 (0.09)	29.5 (0.03)
Years in union	6.9 (0.05)	6.3 (0.12)	5.6 (0.02)
*Number of children^*	1.80 (0.01)	0.80 (0.02)	0.94 (0.01)
*Age of the youngest child (parous women)^*	11.2 (0.04)	1.3 (0.05)	2.8 (0.02)
Age at the start of the 1st union	23.7 (0.03)		
Age at the start of the 2nd union	30.7 (0.07)		
	% at the end of the study	**% at the time of abortion**	**% at the time of birth**
*Ever had an abortion^*	23.2		
Low education	14.3	45.8	16.9
Middle education	70.5	51.2	70.7
High education	15.2	3.0	12.4
*In union^*	71.0	37.2	92.3
Parental SES: Manual worker	40.3		
Parental SES: Lower-level employee	23.2		
Parental SES: Upper-level employee	12.7		
Parental SES: Other	23.8		

^ Measured at the end of the study period.

Table 5.2 provides information on sequencing of the partnership events and pregnancies. Around nine per cent of women in the sample never entered a cohabiting union or marriage, whereas around a fifth cohabited but never married and 16 per cent married but never cohabited. Around 30 per cent of the sample had more than one cohabiting union but only three per cent 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 in the sample experienced at least one union dissolution.

Table 5.2 also shows that most women in the sample who ever got pregnant (the number of ever pregnant women was N=14,549, which represents 81 per cent of the sample), only experienced pregnancies ending in birth (72 per cent of ever pregnant women). A little fewer than five per cent of them only experienced abortions. Around 12

per cent postponed childbearing by terminating their first pregnancy (or first pregnancies), but later had birth(s), and five per cent first had birth(s) which were followed by abortion(s). These women may have used abortion to limit the number of children in their family. The rest of the women experienced more complex pregnancy histories.

Table 5.2. Sequencing of partnership events and pregnancy outcomes, % and N.

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

Notes: ^ Or unions which became marriages the same year cohabitation started; N of unions.

5.6.2 Unobserved characteristics

In all the conducted multi-level models, the woman-specific error variances were statistically significantly different from zero (the 95 per cent credible intervals did not include 0), indicating there were time-invariant woman-level unobserved characteristics affecting women's likelihood of terminating a pregnancy, giving birth, or leaving a romantic relationship. 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 (Table 5.3). The correlations were significant, as indicated by the credible intervals as well as the Bayesian DIC values (see *section 2.2.2* for more information), which were smaller for the model where correlations between the three random effects were allowed for (305,227) than for the model where the correlations were restricted to zero (305,299).

The correlation between the random effect of the abortion model and that of the birth model was negative (-0.23) in the competing risks model and (-0.21) in the three process model (Table 5.3). It suggests women with above-average risk of an abortion have a below-average risk of giving birth due to time-invariant characteristics that were not included in the model.

Table 5.3. The variances of the random effects and their correlations across equations (95% credible intervals (CI) in parentheses).

a. Single-process (for union dissolution) and competing risks (for pregnancy outcomes) models.

OUTCOME	*Union dissolution*	*Abortion*	*Birth*
Union dissolution	0.39 (0.33, 0.46)		
Abortion		0.47 (0.35, 0.60)	
Birth		-0.23 (-0.39, -0.05)	0.17 (0.14, 0.20)

b. Three-process model.

OUTCOME	*Union dissolution*	*Abortion*	*Birth*
Union dissolution	0.40 (0.33, 0.46)		
Abortion	0.38 (0.22, 0.54)	0.50 (0.39, 0.64)	
Birth	0.16 (0.03, 0.30)	-0.21 (-0.39, -0.05)	0.17 (0.14, 0.20)

Notes: Diagonals show the variance (95% CI) of the random effect and off-diagonals the respective correlations between the random effects (95% CI).

The correlation between the random effects of the abortion and the union dissolution models was moderately strong and positive (0.38), suggesting women with an above-average risk of a union dissolution due to unobserved characteristics also had an above-average risk of an abortion due to variables that were not observed in this study. 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 the likelihood of terminating a pregnancy.

The correlation between the random effects in the birth and union dissolution models was statistically significant and positive but quite weak (0.16). A positive correlation implies that a woman with a higher propensity of union dissolution due to time-invariant unobserved characteristics also had above average propensity to give birth.

I will return to the possible characteristics that could be behind the observed random effect correlations in section *5.7 Discussion*.

5.6.3 Observed characteristics and the hazard of abortion

The fixed parts of the competing risks and the three process models were remarkably similar (Table 5.4). Thus, the results I report below refer to the three-process model, but in most cases also hold for the competing risks model.

Figure 5.1 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. This result is interesting, as tendency of cohabiting unions to become more like marriages over time has also been found in other studies comparing these two types of unions (Hoem, Jalovaara, and Muresan 2013; Holland 2011; Lyngstad, Noack, and Tufte 2011; Perelli-Harris et al. 2014).

Women with their youngest child aged less than three years had around three times higher odds of abortion than women with no children (Table 5.4a). The odds also were higher than among women with older children. The risk did not vary 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, probably due to ineffective contraceptive use and attempting to use lactation as a method of pregnancy prevention (Vikat, Kosunen, and Rimpela 2002).

Having ever had an abortion increased the risk of having another one by about 40 per cent. As suggested by previous studies (e.g. Regushevskaya et al. 2009; Väisänen 2015, 2016), low education and lower parental socioeconomic status were associated with a higher likelihood of abortion. The odds of abortion were negatively associated with age (Table 5.4a).

Table 5.4. Odds ratios of MCMC models (single-process/competing risks and three process models) with ESS and p-values.

	a. Outcome: abortion.				*b. Outcome: birth.*			
	Competing risks		**Three-process**		**Competing risks**		**Three-process**	
	OR (p)[a]	**ESS**	**OR (p)[a]**	**ESS**	**OR (p)[a]**	**ESS**	**OR (p)[a]**	**ESS**
CONSTANT	0.01	5,705	0.01	9,230	0.01	11,823	0.01	12,099
UNION STATUS (ref.= Not in union)								
Married	0.42	21,944	0.40	21,444	24.10	11,827	24.05	11,893
Cohabiting	0.81	28,726	0.82	28,010	6.22	11,864	6.24	12,306
PREGNANCY INTERVAL								
Years since age 15 or last pregnancy	1.09	14,190	1.09	13,352	1.07	13,613	1.07	14,294
Years since age 15 or last pregnancy^2	1.00	8,175	0.99	7,859	1.00	13,258	1.00	13,782
LENGTH OF UNION								
Years in union	1.04 (0.054)	15,207	1.05 (0.013)	13,265	0.95	10,951	0.95	4,277
Years in union^2	1.00	10,807	1.00	10,471	1.00	6,873	1.00	5,854
*Years in union*Cohabiting*	0.87	19,529	0.88	19,351	1.16	14,563	1.16	13,733
*Years in union^2*Cohabiting*	1.01	16,617	1.01	16,463	0.99	7,959	0.99	7,481
NUMBER AND AGE OF CHILDREN (Ref.= Childless)								
One child aged < 3 yrs	2.79	18,214	2.76	16,803	3.16	12,979	3.11	12,353
One child aged ≥ 3 yrs	1.44	21,595	1.42	19,315	0.95 (0.049)	19,118	0.92 (0.009)	19,020
Two or more children, youngest < 3 yrs	3.41	1,421	3.31	1,265	0.58	1,593	0.56	1,081
Two or more children, youngest ≥ 3 yrs	1.41	2,283	1.35	1,581	0.27	1,509	0.27	996
EVER HAD AN ABORTION	1.40	176	1.40	218	1.21	421	1.19	267
UNION DISSOLUTION	2.62	20,113	2.33	8,404	0.41	22,574	0.40	19,019
EDUCATION (Ref.= Low education)			1.37[b]	18,172			0.87[b]	17,332
Middle education	0.73	24,862			1.14	15,451		
High education	0.51	12,867			1.39	16,074		
PARENTAL SOCIOECONOMIC STATUS (Ref.= Manual worker)								
Lower-level employee	0.95 (0.082)	16,723	0.94 (0.057)	16,929	0.93	16,085	0.94 (0.001)	15,843
Upper-level employee	0.83	17,969	0.81	17,201	0.87	15,323	0.90	15,159
Other	0.91 (0.011)	16,582	0.91 (0.008)	16,421	1.01 (0.303)	15,547	1.02 (0.193)	14,660
AGE (mean centred)	0.96	18,359	0.96	17,154	0.98	14,892	0.98	12,180

Notes: (a) p-values p<0.001 unless otherwise stated in parenthesis; (b) Estimate for low education, reference category: Middle or high education.

Table 5.4. Continued. *c. Outcome: union dissolution.*

	Single-process		Three-process	
	OR (p-value)[a]	**ESS**	**OR (p-value)[a]**	**ESS**
CONSTANT	0.02	7,163	0.01	5,688
COHABITING (ref.= Married)	6.00	10,185	5.93	10,196
LENGTH OF UNION				
Years in union	1.08	8,540	1.08	8,101
Years in union^2	1.00	8,977	1.00	8,836
*Years in union*Cohabiting*	1.01 (0.193)	11,114	1.01 (0.208)	10,643
*Years in union^2*Cohabiting*	1.00	12,184	1.00 (0.001)	11,617
NUMBER OF UNIONS (Ref.= One)				
Two or more	2.04	8,227	2.06	6,465
AGE AT THE START OF THE UNION	0.95	16,592	0.95	14,200
PREGNANCIES DURING CURRENT YEAR (Ref.= None)				
Abortion	5.99	13,871	5.32	13,848
Birth	0.05	2,853	0.05	2,336
*Abortion*cohabiting*	0.62 (0.002)	15,880	0.62 (0.001)	16,067
*Birth*cohabiting*	3.17	3,060	3.18	2,531
NUMBER AND AGE OF CHILDREN (Ref.= Childless)				
One child aged < 3 yrs	0.57	20,899	0.55	19,118
One child aged ≥ 3 yrs	1.12 (0.002)	17,244	1.11 (0.004)	15,514
Two or more children, youngest < 3 yrs	0.37	15,356	0.35	1,064
Two or more children, youngest ≥ 3 yrs	0.80	11,346	0.75	811
EVER HAD AN ABORTION	1.39	12,510	1.19	275
EDUCATION (Ref.= Low education)			1.32[b]	11,333
Middle education	0.75	17,093		
High education	0.66	13,304		
PARENTAL SOCIOECONOMIC STATUS (Ref.= Manual worker)				
Lower-level employee	1.10 (0.002)	13,462	1.08 (0.004)	12,662
Upper-level employee	1.24	13,498	1.20	12,581
Other	1.01 (0.399)	13,671	1.00 (0.484)	12,524

Notes: (a) p-values p<0.001 unless otherwise stated in parenthesis; (b) Estimate for low education, reference category: Middle or high education.

Figure 5.1. Predicted population median probabilities of abortion based on the fixed part of the three-process model.

5.6.4 Observed characteristics and the hazard of birth

Married women had a higher likelihood of giving birth than cohabiting women, but both groups had markedly higher odds of giving birth than single women (Table 5.4b). Mothers of one toddler had a higher risk of giving birth than those whose children were older, those who had at least two children, and those who had no children. This perhaps reflects a desire to have one's children relatively closely spaced but to stop childbearing after having had two children. Women who had at least two children were less likely to give birth than those who did not have any. Having had an abortion in the past was associated with an increased likelihood of giving birth. The association between education and the likelihood of birth was positive. Higher parental socioeconomic status was negatively associated with the likelihood of giving birth.

5.6.5 Observed characteristics and the hazard of union dissolution

The odds of union dissolution were higher among cohabiting than married couples (Table 5.4c). Having an abortion was associated with high odds of experiencing a union dissolution within the same year (more than five times the odds compared to those who did not experience a pregnancy), whereas giving birth had the opposite effect. The latter association is in line with previous studies, which have shown that expecting a child is associated with lower risk of union dissolution (Steele et al. 2005). Both effects were less strong for

cohabiting than married couples. I will return to the differences between these groups in section *5.7 Discussion*.

Women with young children were less likely to separate from their partners than women with children who were at least three years old and women who had no children. Interestingly, the highest odds of union dissolution were observed among those who had one child older than three years of age. Having had an abortion in the past increased the risk of union dissolution in the single-process model, but the association was weaker when the relevant processes were modelled simultaneously. Higher education and higher parental socioeconomic background was associated with lower risk of union dissolution in all cohorts (Table 5.4c).

5.7 Discussion

In this study I aimed to examine whether and how the decision-making processes regarding abortions, births and union dissolutions are intertwined. I examined this by modelling the three processes simultaneously and testing whether the unobserved (random) parts of these models were correlated with each other. All the random effects correlations in my models were statistically significant, confirming that these processes were intertwined. It has been suggested that ignoring such correlation and estimating the models separately leads to bias in the estimates of the observed part of the model (Lillard 1993; Steele et al. 2005), but in my study the odds ratios of single-process and competing risk models were similar to the odds ratios in the three-process model. Thus, the bias did not seem to be severe in this case. However, modelling the three processes simultaneously shows *how* they were intertwined due to unobserved factors and makes it easier to understand the possible mechanisms behind these findings.

Unobserved heterogeneity indicates that there were unobserved time-invariant woman-level characteristics, which were associated with their 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 (see e.g. Berg et al. 2013); attitudes towards abortion, as women who have negative attitudes towards abortion may not terminate a pregnancy even if it was unwanted (Johnson-Hanks et al. 2011); religiosity, which at least in the US has been associated with more negative attitude towards abortion (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 (note that this only applies if the preference remains unchanged over time—but longitudinal studies in the US have suggested that among the majority of people long-term fertility preferences stay constant over several years (Heaton, Jacobson, and Holland 1999; White and McQuillan 2006)).

Below I discuss the findings showing how the decision-making process regarding abortions was intertwined with union dissolutions and births, and briefly how the decision-making process regarding births was intertwined with union dissolutions.

5.7.1 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. 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. It can be challenging to use contraceptives consistently while going through big changes in life, which may lead to an increased risk of an unintended pregnancy, and in turn, abortion. It could also be that women with less stable union histories simply have a longer exposure time to those periods in life, when the likelihood of abortion is relatively high. Periods preceding union dissolution are such periods of higher risk of abortion.

Having an abortion was strongly and positively associated with separating from one's partner within the same year. Albeit not a causal association, it implies these events often happen within a short temporal distance. If we interpret union dissolution as an indicator of problems in the relationship shortly before 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).

The likelihood of abortion varied depending on the type and length of the union, according to the results of this study. 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. After that, the risks were at similar levels among both groups. This is in line with studies showing that although cohabitation may be a matter of convenience rather than

an indicator of a committed marriage-like relationship at the beginning of the union, cohabitations become similar to marriages over time (Hoem, Jalovaara, and Muresan 2013; Holland 2011; Lyngstad, Noack, and Tufte 2011; Perelli-Harris et al. 2014).

Having an abortion was strongly associated with the woman's union dissolving within the same year, but the effect was less strong for cohabiting than for married couples. 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), which is not necessarily an indicator of problems within the relationship and thus not associated with union dissolution. Perhaps it is less likely for married women to think a pregnancy happened too early in the relationship, and thus abortions more often are correlated with problems in the union and subsequently union dissolution than among cohabiting women.

5.7.2 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 regardless of whether it was estimated jointly with the union dissolution equation (around -0.2 in both models). This implies that due to time-invariant characteristics that were not included in the model, women who had a below-average risk of giving birth, had an above-average risk of abortion. Such characteristics may include, for example, religious beliefs which sometimes are associated with negative attitudes towards abortion (Ellison, Echevarría, and Smith 2005; Hess and Rueb 2005) and high fertility (Frejka and Westoff 2007; McQuillan 2004); negative attitudes towards abortion whether based on religion or not together with persistent issues with efficient contraceptive use.

5.7.3 Births and union dissolutions

The random effects correlation between the union dissolution and birth models was relatively weak but positive. A positive correlation implies 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 pattern may emerge if couples in a new partnership wish to have a child together in order to show commitment to each other, resulting in a higher fertility than among those who have had fewer partnerships (Balbo, Billari, and Mills 2013) or if women hope having a child together stabilises their otherwise precarious relationship (Leone and Hinde 2007). The correlation was not very strong in my

study, which may be because marrying more than once was rare in these data, 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 cohabiting union most women experienced happened early in the life course and was not as committed of a relationship as most marriages are (see Perelli-Harris et al. 2014). Unions (regardless of the type of the union) starting later in the life course may be more likely to be committed and include childbearing. Thus, the likelihood of having children within a relationship may have more to do with the stage of the life course than with the number of previous unions in Finland.

A conception leading to a birth was associated with a low likelihood of a union dissolution within the same year. This stabilising effect was less strong for cohabitations than for marriages. Again, it may be due to the different nature of these two types of unions particularly in the early stages of the relationship.

5.7.4 Limitations and strengths 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). In this study 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). Modelling education and career trajectories together with pregnancy and relationship transitions would have increased our understanding on how these processes are intertwined. Unfortunately, that was not possible here due to lack of appropriate data on education and career transitions—it would have been necessary to know, for example, when women completed their education and transitioned into employment, unemployment, and/or were not active in the labour market, but as in my study educational level and labour force participation were only measured three times (at ages 20, 25, and 30), such analysis was not possible. Future studies should address this issue.

Moreover, I had to make assumptions regarding some aspects of the relationships. As my data did not contain information regarding whether union transitions happened with the same or with a different partner, I had to assume, for instance, that someone transitioning from cohabitation to marriage without living alone in between married their cohabiting partner, although in some cases the marriage may have happened with a new partner. Moreover, when Statistics Finland registers someone as ‘cohabiting’, it is based on the

assumption that a man and a woman who are not relatives and who live together are a couple unless at least one of them is married to a third person, although in some cases they may only be sharing a home but not a romantic relationship.

I cannot claim that there is a causal relationship based on the results of this study, as the timing of the events was not clear. For instance, if an abortion 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 if finding a new place to live in turns out to be difficult. 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 in this study.

Many of the limitations of this study could be solved by collecting survey and qualitative data about the reasons women give for abortions, births and union dissolutions. If those data were combined with register data on abortion, even underreporting would not be a major issue. Future research projects should aim to collect such data.

The strengths of this study include the reliability of the dataset, which does not suffer from underreporting of abortion common in surveys (Jones and Kost 2007), or attrition over time common in longitudinal studies. Moreover, to the best of my knowledge, this is the first time multi-process modelling has been applied to a study taking into account abortions, births and union dissolutions, thus making an important contribution to the research in this field.

5.8 Appendix: Convergence of the MCMC chains

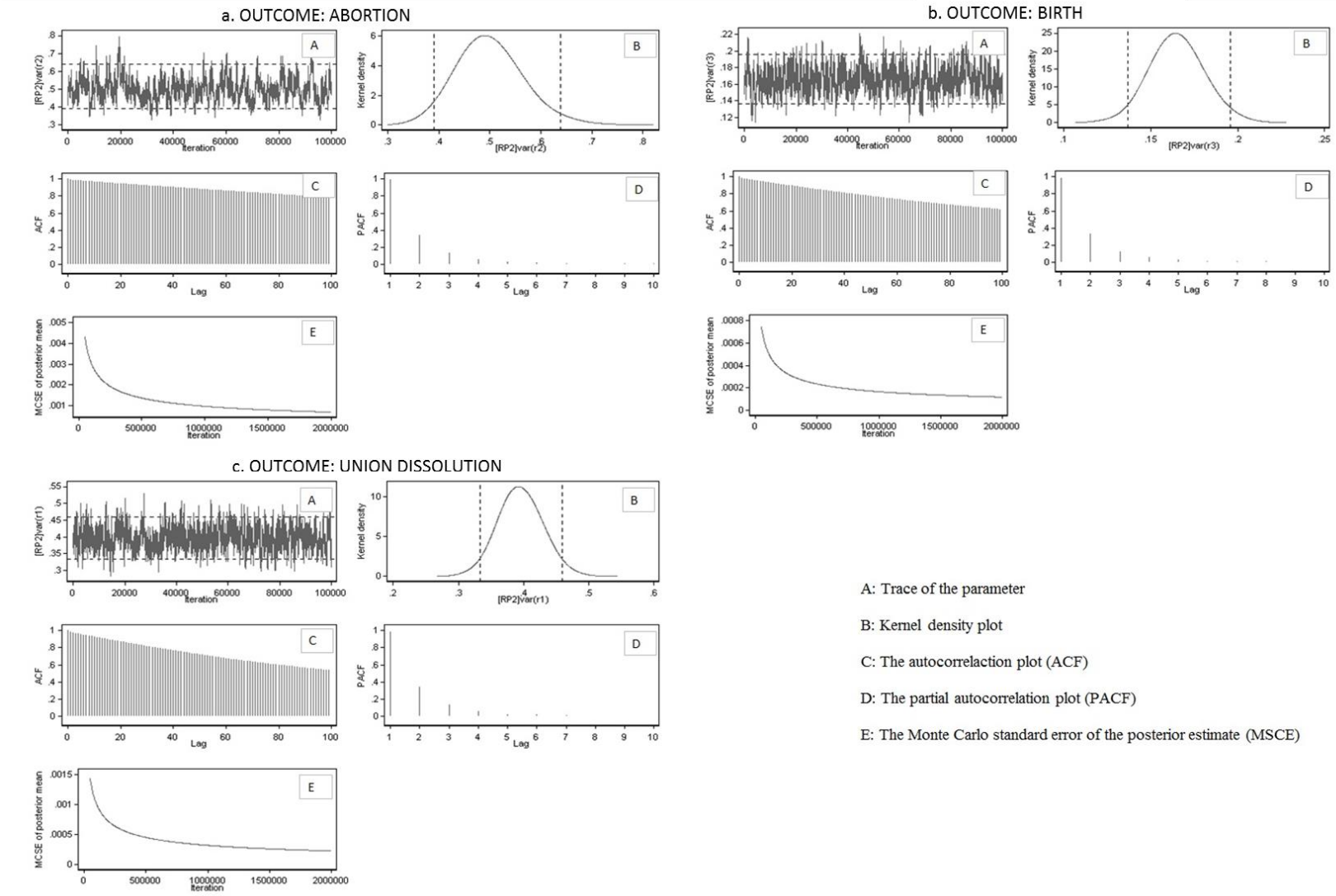
The convergence diagnostics suggest that with the possible exception of variable "ever had an abortion", the chains have converged in an appropriate manner when the fixed part of the model was estimated. The ESS values reported in Table 5.4 are high. In addition the traces of the variables (not shown) showed no trending for other variables than minor trending for "ever had an abortion". However, the diagnostics suggest possible problems when it comes to the random parts of the model. The traces of the models showed some trending for all random effects variables, and thus I investigated them further.

The random effect of union dissolution showed some evidence of trending (Appendix figure 5.1c), but a Kernel density plot was normally distributed, and both ACF and PACF showed a declining trend, which suggest that the convergence may have been satisfactory nevertheless. Although MCSE of posterior mean suggests that more information could have been obtained by including up to 500,000 iterations (Appendix figure 5.1c), the other measures of the number of iterations (Raftery Lewis and Brooks Draper) suggest a much smaller number of necessary iterations (up to 84,782, not shown). Thus, I concluded that the trade-off of much longer estimation time that would have been required in order to increase the number of iterations to up to 500,000 would have gained little, especially as the other tools returned satisfactory results.

The random effect of birth model showed similar diagnostics as the union dissolution random effect (Appendix figure 5.1b) with the exception that its Raftery Lewis diagnostic estimated that more information could have been gained for up to 113,038 (not shown) iterations in the three-process models. However, it would have been unlikely that adding around 13,000 iterations would have dramatically changed the results, and therefore I decided to make no changes.

Unfortunately, the random effect of the abortion model was the most problematic (Appendix figure 5.1a). It showed more trending than the other random effects estimates, and its ACF declined less rapidly. The Kernel density plot showed slight skewing to the right, but was acceptable otherwise. The Raftery-Lewis suggested that up to 110,334 iterations would be needed, whereas Brooks-Draper yielded 141,909 (not shown). The MCSE of posterior mean suggested that more information could have been obtained by including up to 500,000 iterations. Thus, I conducted robustness checks comparing the single-process model of abortion with 100,000 iterations (and burn-in period of 10,000

iterations), which returned similar diagnostics as the three-process model, to a model with 200,000 iterations with a burn-in period of 15,000 iterations. As the results were very similar to those obtained with the smaller number of iterations, I did not re-run all the models with the higher number of iterations. Even with 100,000 iterations the three-process model took six to seven days to converge and thus the gain of waiting twice the length of time would have been small.



Appendix figure 5.1. Diagnostics of the MCMC three-process models.

6. Adolescent births, abortions and the pathway from parental to own socioeconomic position[18]

Abstract

One's socioeconomic status (SES) is associated with that of their parents in Finland and elsewhere. However, few studies have examined the extent to which teen fertility behaviour mediates this association. Instead, most research on teenage motherhood focus on its causal effect on later SES. This study shows that a part of the association between parents' and individuals own SES in Finland is due to fertility behaviour in adolescence even when taking into account teenage mothers' less advantaged socioeconomic backgrounds. Unlike most previous research on the topic, this paper also examines the socioeconomic outcomes of those who had an abortion as a teenager and shows it did not mediate the association from parents' to own SES. A set of register data of three cohorts of Finnish women (N=274,908) was analysed using a recently developed Karlson-Holm-Breen mediation method. Up to nine per cent of the total association between parents' SES and own education was explained by having had a teen birth, but teen abortions were not important mediators. Furthermore, educational attainment and births in early 20s were important predictors of women's income level and probability of unemployment at age 30. These associations may be due to accumulation of disadvantage and unobserved characteristics affecting both timing and outcomes of pregnancies and educational attainment. To help young mothers gain a higher salary and secure employment, policy-makers should help them to complete their education.

Keywords: *teenage pregnancy; induced abortion; Finland; mediation; register data; intergenerational transmission*

[18] This paper has been submitted to a peer-reviewed journal.

6.1 Introduction

Studies in many countries have shown there is an association between having become a teenage mother and low socioeconomic position later in life (Hoffman 1998; Olausson et al. 2001; Lawlor and Shaw 2002; Paranjothy et al. 2009; Taylor 2009; Mollborn 2010; Kane et al. 2013; Assini-Meytin and Green 2015). Research on this topic often focuses on establishing whether there is a causal link between teenage motherhood and socioeconomic outcomes (e.g. Diaz and Fiel 2016; Geronimus and Korenman 1992; Hoffman, Foster, and Furstenberg Jr. 1993; Kane et al. 2013; Lee 2010). The task is difficult, as teenage pregnancies are not randomly distributed within the population. Teen mothers typically come from less advantaged backgrounds than those who postpone their motherhood, and thus they would have had a high likelihood of low socioeconomic status (SES)[19] even if they had not become young mothers.

Instead of focusing on whether entering parenthood before age 20 has a *causal* effect on later socioeconomic status, I approach the issue from a different perspective. Using an analytic strategy more familiar from the literature on intergenerational transmission of socioeconomic position and its mediators[20] (e.g. Anger 2012; Björklund and Jäntti 2009; Blanden and Machin 2004; Bowles and Gintis 2002; Devine and Li 2013; Erola 2009; Karlson and Holm 2011; Mood, Jonsson, and Bihagen 2012; Sirniö, Martikainen, and Kauppinen 2013), I study whether having become a teen mother mediates the pathway from parents' socioeconomic status to that of the woman's own in three birth cohorts of Finnish women. Finding such an association would indicate that becoming a young mother contributes to socioeconomic outcomes at the population level. The study is exceptional because it compares teenage mothers not only to those who did not experience a teen pregnancy, but also to those who experienced an abortion as a teenager. This provides more nuanced information about the association between teen pregnancies and later socioeconomic status than only studying teenage motherhood. Among pregnant Finnish teenagers, those from less advantaged backgrounds are more likely to give birth than terminate the pregnancy (Väisänen and Murphy 2014). Thus, adolescent women who have

[19] Socioeconomic status is defined here as the level of education or income, occupational status, being employed or unemployed; or a combination of these characteristics.

[20] An association between the explanatory variable of interest (parents' socioeconomic status) and the outcome (own socioeconomic status) through a third variable is called mediation or an indirect effect. 'Direct effect' is the part of the association from the explanatory variable to the outcome that does not travel through the third (i.e. the mediator) variable.

an abortion are likely to share a range of (unobserved) characteristics with adolescent mothers, making them more likely to experience an unintended pregnancy, but are more similar in their socioeconomic backgrounds to those who had no teen pregnancy than teenage mothers.

The study uses an innovative method called Karlsson-Breen-Holm (KHB) to study mediation (see section 2.2.3 for more information). In the past KHB has been used to estimate, for instance, whether education contributes to the reproduction of social inequality in the labour market (Triventi 2013), and school mobility (Fiel, Haskins, and Turley 2013), but this is the first time the method is applied in a study of this topic.

The data of the study were extracted from Finnish population registers. These data are excellent in longitudinal studies of topics, which are typically underreported in surveys. Register data are immune to attrition, underreporting, and recall bias. However, as the data come from administrative registers, certain types of variables, such as information on attitudes or religion, are not available. Thus, the advantages of using register data lie in detailed description of events difficult to capture using surveys rather than in theory building or testing causal relations.

6.1.1 Theoretical framework

The mechanisms behind lower socioeconomic status of young mothers and research on intergenerational transmission of socioeconomic standing are discussed below. As the purpose of this study is to test whether the association between parents' and own socioeconomic status is mediated by teenage births or abortions using a reliable large-scale longitudinal dataset, rather than theory building, this section is kept concise.

Previous studies have found associations between the occupational position, education and income level of parents and their children in many countries, for instance the United States, the United Kingdom (e.g. Björklund and Jäntti 2009; Blanden and Machin 2004; Devine and Li 2013) and in Finland (e.g. Erola 2009; Sirniö, Martikainen, and Kauppinen 2013). This may be due to, for instance, parents using their networks to make sure their children are able to enter good schools and jobs, the culture within the family encouraging children to complete high education and pursue career, parents using their financial and other resources to ensure their children will do well in socioeconomic terms (Bowles and Gintis 2002; Goldthorpe 2000), or a combination of these behaviours. A part of the association from parents' to own socioeconomic status may travel through other

factors, such as individuals' intelligence and personality (Anger 2012; Mood, Jonsson, and Bihagen 2012), or parenting resources and styles (Björklund, Jäntti, and Solon 2007). Parents' economic resources matter more in settings where education is expensive and thus countries like Finland, where education is free of charge, typically show higher levels of social mobility than countries where education is expensive (Björklund, Jäntti, and Nybom 2012).

Teenage mothers typically come from less advantaged backgrounds, end up having lower education and income, and are more likely to experience unemployment than their childless peers or older mothers (Diaz and Fiel 2016; Hoffman 1998; Olausson et al. 2001; Lawlor and Shaw 2002; Paranjothy et al. 2009; Taylor 2009; Kane et al. 2013; Assini-Meytin and Green 2015). The few studies which have studied socioeconomic outcomes of young women who had an abortion showed having an abortion before age 20 (Fergusson, Boden, and Horwood 2007 in New Zealand) or 25 (Olsson et al. 2014 in Australia) was associated with higher socioeconomic status than having a child, but lower compared to those who had no pregnancy in adolescence (controlling for parents' socioeconomic status).

Distinguishing the effect of teen pregnancies from that of the low parental socioeconomic status of these women is difficult, because the same factors increase the likelihood of teenage pregnancy and low socioeconomic status (Hoffman 1998; Kane et al. 2013). For instance, adolescents who perceive their chances of entering higher education as low might see starting their own family as a way of transitioning into adulthood (Smith and Roberts 2011). Alternatively, these women may be children of young mothers and their early entry to motherhood may be due to the intergenerational transmission of age at first birth (Barber 2001; Murphy and Knudsen 2002). The impact of becoming a young parent may also differ by background characteristics: it may be more harmful in socioeconomic terms among those who come from backgrounds where teen parenthood is atypical (Diaz and Fiel 2016). Some studies have found a causal link from teenage childbearing to lower socioeconomic status using quasi-experimental methods such as propensity score matching (Lee 2010), sibling fixed effects (Geronimus and Korenman 1992; Hoffman, Foster, and Furstenberg Jr. 1993), or discrete factor models of treatment effect (Kane et al. 2013).

6.1.2 Context of the study

The Finnish family policies and other relevant context have been described in section 1.4 of this thesis.

Teenage pregnancy rates are relatively low in all Nordic countries (e.g. five times lower than in the United States (Wilkinson and Pickett 2010)) and among these countries, Finland has had one of the lowest teen childbearing rates and the lowest teen abortion rate since the mid-1980s (Bender, Geirsson, and Kosunen 2003; Leppälahti et al. 2012). From the mid-1970s until the mid-1980s the teenage abortion rate in Finland was 20 per 1000 women aged 15 to 19. It declined to 10 in the mid-1990s but has been around 14 per 1000 women since the end of the decade (Leppälahti et al. 2012; Vuori and Gissler 2013; Gissler and Heino 2011). Teenage birth rate declined quite steadily from 27 per 1000 women in 1975 to 10 in 1999 and 8.5 in 2009 (Gissler and Heino 2011).

6.1.3 Hypotheses

Based on the literature summarised above, I formulated the following hypotheses.

1. I expect teenage childbearing to mediate the association from parents' to own socioeconomic status not only because it is concentrated among women from low socioeconomic background, but also because it makes finishing school increasingly difficult due to childcare responsibilities. Low education in turn increases the risk of unemployment and low income.
2. I expect having an abortion as a teenager not to mediate the association between parents' and own socioeconomic status strongly. The association between teen abortion and lower socioeconomic status in adulthood observed in earlier studies (Fergusson, Boden, and Horwood 2007) may be due to unobserved characteristics associated with both high likelihood of teenage pregnancy and low socioeconomic status (Hoffman 1998; Kane et al. 2013).
3. I expect births in early 20s to mediate the association from parents' to own socioeconomic status. I focus on fertility behaviour before age 25, since typically women of that age who wish to achieve higher education are still studying (Driscoll 2014). Teen mothers who postpone subsequent childbearing may end up with higher socioeconomic status than those who continue childbearing in their early 20s. Furthermore, those who have an abortion in adolescence may enter parenthood on average earlier than those who had no teen pregnancy, which could explain the socioeconomic gap between these two groups.

Figure 6.1 shows the pathways I examined in this study.

6.2 Data and methods

6.2.1 Data

The dataset I used in this study has been described in section *2.1.2 Data of the Study*. I measured women's socioeconomic status using three indicators: higher (i.e. tertiary) education, annual taxable income in Euros (top coded at €200,000 and transformed into the value of Euros in 2009), and unemployment (measured based on economic activity in the last week of the year, the other possibilities being employed, student, or inactive). These variables were measured at age 30 or the nearest year possible, because before year 1987 this information was only available in population registries every five years. I chose education, income and unemployment as the outcomes of interest, because they represent a wide range of socioeconomic characteristics. I selected tertiary education as the level of interest due to the high proportion of Finns having at least upper-secondary education: for instance, between years 1980 and 2010, 60 to 75 per cent of the population in the age group of 20-24 had upper secondary education (Official Statistics of Finland 2015).

Parents' socioeconomic status represents the highest occupational status among the adult members of the household, regardless of whether that was held by the woman's mother, father, or a step-parent. The choice regarding which status was the highest was made by Statistics Finland before the dataset was handed out to me. Parents' socioeconomic status was measured when the women were approximately 15 years old. The categories include upper- or lower-level non-manual employee; manual worker; or other[21], where upper-level employee was regarded the highest status followed by lower-level employees and manual workers. The 'other' category is difficult to fit into this hierarchical order. Other measures of parents' characteristics or women's childhood circumstances were not available.

6.2.2 Analytical strategy

I did not include women who had more than one teen pregnancy in the analyses (N=5791, two per cent of the sample) in order to create an explanatory variable including three

[21] Upper-level employees are in managerial, professional and related occupations, whereas lower-level employees have administrative and clerical occupations. Manual workers typically work in manufacturing or distribution of goods and services. 'Other' category includes farmers, self-employed, students, long-term unemployed, pensioners, those outside the workforce, such as stay-at-home-moms, and those, who do not belong to any of the other categories (Official Statistics of Finland 2013).

mutually exclusive categories: no pregnancy[22], one abortion, or one birth as a teenager. Since the associations probably are stronger among those who had more than one pregnancy, the estimates of the mediating effect of teen pregnancy are conservative. I chose to focus on births and abortions from age 15 to 19, since there was no information about these women's fertility behaviour before age 15 in my dataset and because many previous studies of adolescent pregnancy have focused on women younger than 20 (e.g. Bender, Geirsson, and Kosunen 2003; Driscoll 2014; Lee 2010; Taylor 2009; Väisänen and Murphy 2014).

Overall 245,843 women were included in the analyses. I excluded those with crucial information, such as parents' socioeconomic status, missing. Some women emigrated or died before age 30. I included only those born in Finland and speaking one of the official languages of the country, Finnish or Swedish, as their native language.

I used the KHB -method to examine whether the association from parents' socioeconomic status to one's education, likelihood of unemployment, and level of income was mediated through teenage births or abortions. The method decomposes the contribution of each mediator while holding the others constant (Breen, Karlson, and Holm 2013). Thus, the results show how much teen births and abortions contributed to the associations separately. See section 2.2.3 for more information on the method.

I studied the outcomes of having higher education and being unemployed using logistic regression within the KHB analyses. I conducted the linear regression analysis of income using its natural logarithm as the outcome to improve the normality of its distribution. Model diagnostics showed this improved the fit of the model (available on request). Before making the logarithmic transformation, I added a value of 1 to all observations of income to avoid excluding those who had no taxable income from the analyses.

In the first set of models of these three outcomes, I included parents' socioeconomic status as the key variable and having experienced an abortion or a birth before age 20 as mediators. The second set of models consisted of the direct effect from teen pregnancy to education mediated by births and abortions in ages 20 to 24; and to unemployment and income mediated also by education. I included the number of births and abortions as continuous variables, because preliminary analyses showed they were linearly associated

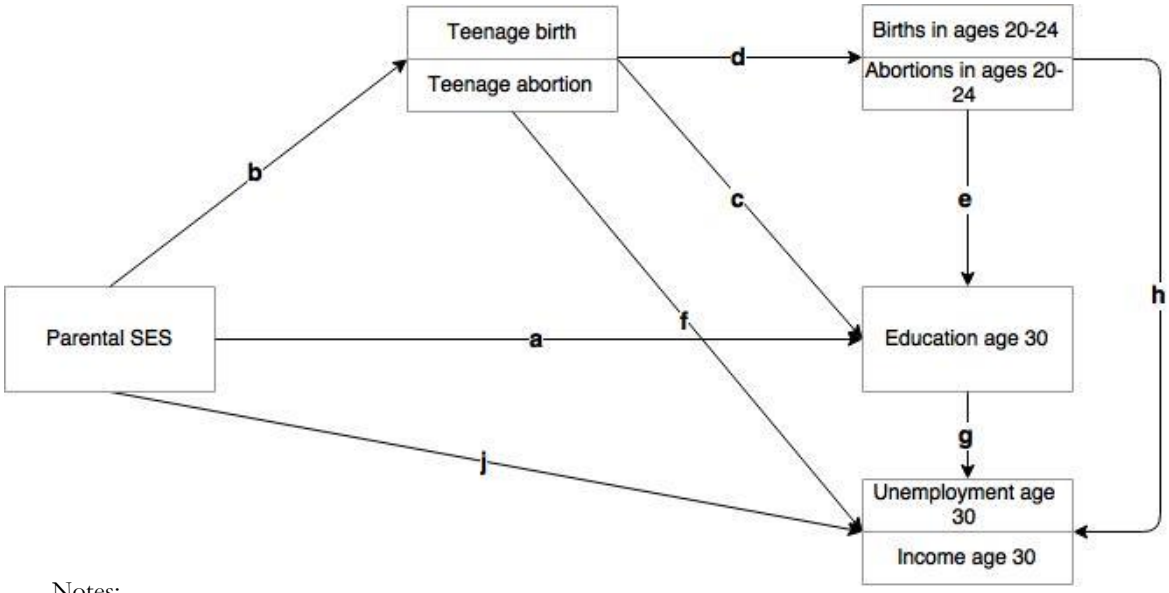
[22] Including those who had miscarriages and/or stillbirths, as no information of these pregnancy outcomes was included in my dataset.

with the outcomes. Parents' socioeconomic status was controlled for. I conducted a series of sensitivity analyses, where each background was analysed separately to study whether mediation patterns varied depending on parental socioeconomic status (results available on request). As the patterns were relatively similar, I chose to include women from all backgrounds in the same model.

When I included education as a mediator, it was measured at age 30—at the same time as the outcomes of those models (unemployment and income). I assumed in most cases the level of education had been achieved before age 30 and thus treating it as a mediator was possible. I included age of the youngest child as a mediator in the income model as a robustness check, because having young children typically has a negative impact on women's income (results available on request). It did not change the interpretation of the results, perhaps due to the generous financial help to mothers from the government in Finland (Vikat 2004), and thus I chose the more parsimonious model.

I present the results based on logistic regression models as average partial effects (fitted probabilities), because the interpretation of coefficients in log-odds scale in logistic regression models is less intuitive than that of probabilities. I show the results of linear regression models as exponentiated regression coefficients, because the outcome was the natural logarithm of income. Exponentiating the estimate values shows the percentage change in income associated with the covariates. To confirm the cohorts differ from each other statistically significantly, I conducted a model for all cohorts. The dummy-variable representing cohort effects showed the categories were significantly different from each other in all models ($p<0.001$). The results shown in this paper were conducted separately for each cohort, which is essentially the same as conducting a pooled analysis for all data and interacting all variables with cohort.

Figure 6.1 shows the pathways I studied. I conducted all models in Stata 13 using the *khb* command (see Kohler, Karlson, and Holm 2011). Although using the *khb* command is not required when mediation is studied using linear regression, it gives the same results as the *regress* command in Stata.



Notes:

Pathways examined in each table	**Direct**	**Indirect**	**Controls**
Table 6.2a (outcome: education)	a	b+c	
Table 6.2bc (outcome: unemployment or income)	j	b+f	
Table 6.3a (outcome: education)	c	d+e	Parents' SES
Table 6.3bc (outcome: unemployment or income)	f	c+g and d+h	Parents' SES

Figure 6.1. Pathways from socioeconomic background to fertility behaviour and socioeconomic attainment in adulthood.

6.3 Results

6.3.1 Descriptive statistics

Approximately five per cent of women of the sample born in 1955–59 had an abortion before age 20 and seven-and-a-half per cent a birth. The corresponding percentages for women born in 1965–69 were six and three, and for those born in 1975–79 three-and-a-half and two, respectively (not shown). Out of first pregnancies before age 20, 59 per cent ended in childbirth among the 1950s cohort, whereas in the other two cohorts over 60 per cent ended in abortion (not shown).

Women from manual worker backgrounds completed tertiary education less often, were unemployed more often, and had lower annual income at age 30 than in particular those from upper-level employee backgrounds. The results varied depending on whether they had experienced a teen birth, abortion or no teen pregnancies. Teen mothers had the lowest socioeconomic status. For instance, in all but one category (upper-level employee background in the 1950s cohort), those who had a birth as a teenager had lower income than other women regardless of their parents' socioeconomic status. Those who had obtained an abortion as a teenager, had higher socioeconomic status than those who had given birth, but

lower than women from corresponding family background who did not experience a teen pregnancy. Mean age at first birth shows how entry into motherhood varied between the two groups of women who did not become teen mothers. On average, women who did not have a teen pregnancy were a year older at the time of their first birth than those who had an abortion. Both groups entered parenthood on average in their mid-twenties (Table 6.1).

Table 6.1. Weighted % of women having higher education, being unemployed and the mean of annual income in Euros age 30 depending on parents' SES and teen pregnancy status, unweighted N.

	Cohort 1955-59			**Cohort 1965-69**			**Cohort 1975-79**		
Paren-tal	**Pregnancies before age 20**								
SES	*None*	*Abortion*	*Birth*	*None*	*Abortion*	*Birth*	*None*	*Abortion*	*Birth*
	Higher education (%) age 30								
Upper	35.4	16.1	5.5	37.9	18.8	3.6	66.3	36.1	16.4
Lower	16.6	6.8	1.6	19.8	7.0	1.2	48.8	23.3	10.7
Manual	7.4	2.1	0.5	10.4	3.1	0.6	37.6	16.9	6.1
Other	10.0	4.0	0.6	14.6	4.7	0.2	43.6	22.2	6.1
	Unemployed (%) age 30								
Upper	1.6	2.2	4.6	7.0	13.2	29.9	3.6	7.1	6.5
Lower	2.5	3.7	6.1	10.2	14.8	19.4	5.3	10.1	13.8
Manual	3.9	5.3	6.9	13.5	17.0	27.8	6.7	10.3	15.0
Other	3.9	4.9	6.8	12.3	17.6	26.1	6.4	10.3	16.4
	Mean annual income (€) age 30								
Upper	12,521	11,385	10,288	17,753	15,023	11,347	24,949	22,132	16,982
Lower	11,067	10,431	8,817	15,629	13,950	11,614	22,670	19,450	17,842
Manual	9,974	9,508	8,553	14,083	13,117	11,009	20,855	18,124	16,364
Other	9,818	9,278	8,120	14,418	12,934	11,412	21,507	19,564	15,375
	Mean age at first birth								
Upper	25.9	24.6	18.3	26.5	25.0	18.5	26.9	25.1	18.4
Lower	25.2	24.3	18.4	25.8	24.5	18.4	26.0	24.6	18.5
Manual	24.5	23.5	18.4	25.3	24.1	18.4	25.5	24.1	18.4
Other	24.6	23.8	18.4	25.5	24.2	18.4	25.7	24.5	18.4
N	81,322	7,761	7,685	79,155	8,068	3,183	47,039	4,577	1,638

6.3.2 The pathway from parents' to women's own SES

Table 6.2a (upper panel) shows the results of the model estimating the direct association from parental to own socioeconomic status and the indirect association via teen births and abortions. Those from the reference group of upper-level employee background were the most likely to pursue higher education. For instance, the probability of achieving higher education was 29 percentage points lower among those from manual worker backgrounds compared to those from upper-level employee backgrounds in the 1970s cohort. Of this difference, 1.4 percentage points were associated with having had a teen birth, and 0.4 percentage points with an abortion.

Confounding percentages revealed that a larger proportion of the effect was mediated through teen births in the earliest cohort than in the other two (Table 6.2a, lower panel). Nine per cent of the effect from parents' socioeconomic status to own education was mediated through teen births among those from manual worker and 'other' backgrounds in the 1950s cohort compared to five to six per cent in the other cohorts.

Those from the reference group of upper-level employee background were the least likely to experience unemployment (Table 6.2b, upper panel). Mediation through teen pregnancies was statistically significant, but the size of the effect was modest. For example, out of the 3.6 per cent higher probability of experiencing unemployment among women from manual worker backgrounds in the 1950s cohort, only 0.2 percentage-points was mediated through teen childbearing and 0.02 through abortion.

Those from upper-level employee background had the highest income, followed by the other groups of parental socioeconomic status (Table 6.2c, upper panel). For instance, in the 1960s cohort those from the lower-level employee background had on average seven per cent lower income than those from the upper-level employee background, and the difference between those from the manual worker background and the reference group was 14 per cent. Teen births mediated four to seven per cent of the total effect, but teen abortions not much (Table 6.2c lower panel).

6.3.3 The pathway from teen pregnancy to own SES

The likelihood of completing higher education was the highest for those who did not experience a pregnancy (Table 6.3a, upper panel). In the 1970s cohort women who had a child had 55 per cent lower probability of completing higher education than women who did not experience a pregnancy, whereas in the 1960s cohort the difference was 42 and in the 1950s 25 per cent. Sixteen percentage points of the difference were mediated through births in ages 20 to 24 in the 1970s, eight in the 1960s, and three in the 1950s cohorts.

Women in the 1970s cohort, who had an abortion as a teenager, had around 27 per cent lower probability of completing higher education compared to women who did not experience a teen pregnancy, of which six percentage points was mediated through births in ages 20 to 24 and two through abortions in ages 20 to 24. The differences were somewhat smaller, but in the same direction in the other cohorts.

In the 1950s cohort, 12 per cent of the total effect from teen birth to educational attainment travelled through births in ages 20 to 24, but increased to 20 per cent in the other

cohorts (Table 6.3a, lower panel). The mediation patterns did not change much among women who had an abortion in adolescence: births in ages 20 to 24 mediated around 20 per cent of the total effect in all cohorts.

Teen mothers were more likely to experience unemployment than those who did not have a teen pregnancy (Table 6.3b, upper panel). The association was more modest in the earliest (2.5 per cent higher probability) and the latest (six per cent) than the middle cohort (10 per cent). Up to two percentage points of these associations were mediated through births in ages 20 to 24 and up to one percentage point through education (depending on cohort). Mediation through births in ages 20 to 24 was more important than mediation through education in the two earliest cohorts (Table 6.3b, lower panel). The order reversed in the latest cohort. A higher proportion of the total effect was mediated in the teen abortion than in the teen birth group: adding up the confounding percentages within each teen pregnancy group and cohort shows that, for instance in the 1950s cohort, 22 per cent of the total effect was mediated in the teen birth group, whereas in the teen abortion group it was 37 per cent. The two proportions were roughly equal in the 1970s cohort.

Teen mothers had 15 to 25 per cent and those who had a teen abortion four to 13 per cent lower income than those who did not experience a teen pregnancy (Table 6.3c, upper panel). The effect was strongly mediated by later fertility and education. Around 21 to 27 per cent of the total effect was mediated through births in ages 20 to 24 and education in the two earliest cohorts among teen mothers (Table 6.3c, lower panel). In the latest cohort 22 per cent was mediated through births in the early 20s and almost a half through education. Mediation was stronger in the teen abortion group, where the direct effect from teen abortion to income was not statistically significant for the earliest and the latest cohorts.

Table 6.2. The direct effect from SES background on own SES at age 30 with mediation through teenage births and abortions.

	A. Outcome: higher education. Logistic regression.			B. Outcome: unemployment. Logistic regression.			C. Outcome: logarithm of income. Linear regression.		
	APE (%)			**APE (%)**			**Exponentiated coefficients**		
Parents' SES // Cohort:	**1955-59**	**1965-69**	**1975-79**	**1955-59**	**1965-69**	**1975-79**	**1955-59**	**1965-69**	**1975-79**
Manual worker									
Total effect	-19.5	-22.7	-29.2	3.6	7.8	3.8	0.85	0.86	0.88
Direct effect	-17.5	-20.9	-27.4	3.4	7.3	3.6	0.86	0.87	0.89
Indirect effect									
Teen birth	*-1.8*	*-1.2*	*-1.4*	*0.2*	*0.3*	*0.1*	*0.99*	*0.99*	*0.99*
Teen abortion	*-0.2*	*-0.5*	*-0.4*	*0.02*	*0.1*	*0.05*	*1.00*	*1.00*	*1.00*
Lower-lever employee									
Total effect	-9.9	-12.4	-17.7	1.8	4.2	2.4	0.93	0.93	0.95
Direct effect	-9.2	-11.4	-16.7	1.8	4.0	2.3	0.94	0.94	0.96
Indirect effect									
Teen birth	*-0.6*	*-0.5*	*-0.7*	*0.1*	*0.1*	*0.1*	*1.00*	*1.00*	*1.00*
Teen abortion	*-0.1*	*-0.4*	*-0.3*	*0.02*	*0.1*	*0.03*	*1.00*	*1.00*	*1.00*
Other									
Total effect	-15.7	-17.4	-23.0	3.5	6.7	3.5	0.83	0.86	0.89
Direct effect	-14.2	-16.1	-21.6	3.3	6.3	3.4	0.83	0.87	0.90
Indirect effect									
Teen birth	*-1.4*	*-1.0*	*-1.1*	*0.1*	*0.2*	*0.1*	*0.99*	*0.99*	*0.99*
Teen abortion	*-0.1*	*-0.3*	*-0.3*	*0.01*	*0.1*	*0.03*	*1.00*	*1.00*	*1.00*
Confounding %: Manual									
via teen birth	9.2	5.5	4.7	4.8	3.9	3.8	7.4	5.0	6.1
via teen abortion	1.1	2.2	1.4	0.7	1.7	1.3	0.7	2.0	1.7
Confounding %: Lower-level									
via teen birth	6.0	4.4	3.8	3.1	3.2	2.9	5.6	4.8	7.3
via teen abortion	1.5	3.0	1.5	0.9	2.3	1.4	1.1	3.2	2.8
Confounding %: Other									
via teen birth	9.2	5.8	4.7	4.0	3.7	3.2	4.9	4.1	5.1
via teen abortion	0.5	1.9	1.2	0.3	1.3	1.0	0.2	1.3	1.3

All total, direct and indirect effects were significant at level $p<0.001$; Reference category: Upper-level employee; APE=Average partial effects (Tables 6.2a and 6.2b); Coefficients in table 6.2c exponentiated because the outcome is logarithmic. (a) Direct effect is the association from socioeconomic background to the outcome; the indirect effect is the mediation through teen births and abortions. Total effect is the both of these combined. (b) Confounding % describe the proportion of the total effect.

Table 6.3. Direct effect from teen pregnancy on SES at age 30, mediation through births and abortions in ages 20-24 and education (in B and C).

	A. Higher education. Logistic regression.			B. Unemployment. Logistic regression.			C. Outcome: logarithm of income. Linear regression.		
	APE (%)			**APE (%)**			**Exponentiated coefficients**		
Teen pregnancy history // Cohort:	**1955-59**	**1965-69**	**1975-79**	**1955-59**	**1965-69**	**1975-79**	**1955-59**	**1965-69**	**1975-79**
Teen birth									
Total effect	-24.6	-41.5	-55.3	2.5	10.0	5.7	0.85	0.78	0.75
Direct effect	-21.4	-32.1	-36.8	1.9	6.8	3.5	0.92	0.88	0.92
Indirect effect									
Births age 20-24	*-3.0*	*-8.2*	*-15.7*	*0.3*	*1.9*	*0.9*	*0.96*	*0.94*	*0.94*
Abortions age 20-24	*-0.2*	*-1.1*	*-2.7*	*0.1*	*0.4*	*0.2*	*1.00*	*0.99*	*1.00*
Education age 30				*0.2*	*1.0*	*1.0*	*0.96*	*0.95*	*0.87*
Teen abortion									
Total effect	-9.9	-16.4	-27.2	1.1	4.0	3.2	0.96	0.91	0.87
Direct effect	-7.6	-11.6	-19.1	0.7	2.1	2.0	1.02ns	0.98	0.98ns
Indirect effect									
Births age 20-24	*-2.2*	*-4.0*	*-6.1*	*0.2*	*0.9*	*0.4*	*0.97*	*0.97*	*0.98*
Abortions age 20-24	*-0.2*	*-0.8*	*-2.0*	*0.1*	*0.3*	*0.2*	*1.00*	*0.99*	*1.00*
Education age 30				*0.1*	*0.7*	*0.7*	*0.97*	*0.96*	*0.91*
Confounding %: Teen birth									
via births age 20-24	12.2	19.8	28.5	12.4	18.7	16.3	27.2	25.1	21.7
via abortions age 20-24	0.8	2.7	4.9	2.1	3.7	3.8	0.1	3.3	1.5
via high education				7.8	9.8	18.2	23.6	20.6	48.7
Confounding %: Teen abortion									
via births age 20-24	21.7	24.3	22.5	19.2	22.8	11.4	74.0	32.8	17.7
via abortions age 20-24	2.12	4.9	7.4	5.2	6.6	5.0	0.4	6.2	2.3
via high education				12.8	18.2	21.2	65.3	40.5	66.2

All total, direct and indirect effects were significant at level $p<0.001$ apart from those not significant (ns); Controlling for parents' SES. Reference category: No teen pregnancy. APE= Average partial effects; Coefficients in table 6.3c exponentiated because the outcome is logarithmic. Direct effect is the association from teen births/abortions to the outcome, the indirect effect is the mediation through births and abortions in ages 20-24 (in all models) and education at age 30 (in panels B and C). Confounding % describe the proportion of the total effect mediated through births and abortions in ages 20-24 (in all models) and education at age 30 (in tables 6.3b and 6.3c).

6.4 Discussion

6.4.1 Teen births and socioeconomic outcomes

Teen births mediated the association from socioeconomic background to education at age 30. Up to nine per cent of the total association at the population level was explained by having experienced a teen birth. Mediation was not stronger perhaps because only a minority of women gave birth before age 20, but finding a significant effect suggests it is an important part of the pathway from parents' to own socioeconomic status.

Women who perceive their chances of attending higher education to be low may decide to start childbearing early (see e.g. Smith and Roberts 2011 in the UK). This selection into early parenthood may explain why teen births mediated the association. Accumulation of disadvantage may also play a role. Many women from lower socioeconomic background start childbearing relatively early, making attending education more difficult, which leads to a higher chance of unemployment and low income (see e.g. Taylor 2009 in the US).

Interestingly, teen births mediated a lower proportion of the association between parents' socioeconomic status and own education in the later than earlier cohorts. It may be due to teen pregnancies having become less common over time. The associations also varied by socioeconomic background, notably by teen births being less important mediators for those from lower-level employee than for those from manual worker or 'other' backgrounds. Those from more advantaged backgrounds may have received more resources from their parents and were thus able to finish education regardless of early childbearing.

Women from lower socioeconomic backgrounds were more likely to experience unemployment and have lower income than those from higher socioeconomic backgrounds, but mediation through teen births was modest. Thus, the mechanism through which teenage childbearing is associated with low income and unemployment seems to have more to do with socioeconomic background than timing of childbearing. The probability of unemployment was higher in the 1960s cohort than in the other two, because there was a severe economic depression in the 1990s in Finland which increased unemployment (see e.g. Honkapohja and Koskela 1999).

Teen mothers had lower socioeconomic status than others from similar backgrounds and the pathway from teen birth to lower socioeconomic status was mediated by births in ages 20 to 24 and education (when studying unemployment and income). Thus,

accumulation of disadvantage is a plausible explanation of the lower socioeconomic status of teenage mothers. Early childbearing leads to difficulties in completing education, which in turn is associated with lower salary and a higher chance of unemployment. Additional births in the early 20s seem to further accumulate this disadvantage. Education was a more important mediator to income and unemployment in the later than in the earlier cohorts.

6.4.2 Teen abortions and socioeconomic outcomes

Teen abortion was not an important mediator between parents' and own socioeconomic status. I expected this, as some teens may have chosen to terminate their pregnancy in order to be able to finish their education and get stable employment before starting childbearing (see e.g. Ekstrand et al. 2009 in Sweden).

Births in ages 20 to 24 strongly mediated the association between having had a teen abortion and lower education. The remaining direct association may have been due to unobserved characteristics affecting both the likelihood of teen pregnancy and educational attainment. Births in ages 20 to 24 and education mediated a large part of the association from teen abortion to lower income and to the risk of unemployment. These results indicate that similarly to teen births, the mechanism behind the association of having a teen abortion and lower socioeconomic status may be accumulation of disadvantage. Even those who chose to have an abortion and thus did not start childbearing before age 20, often entered parenthood in their early 20s, during the period of life when higher education is typically obtained. Lower education, again, led to lower income and a higher risk of unemployment. This pattern was clear particularly with income: the direct effect from teen abortion to lower income was not even statistically significant in two out of the three cohorts.

6.4.3 Limitations, strengths and implications of the study

There were limitations in this study. A part of the association between fertility behaviour and social mobility may have been due to unobserved characteristics. For instance, a part of the association probably was due to selection of those who did not have plans to aquire higher education into early motherhood. Reducing women's childhood background to one measurement of parents' socioeconomic status may not adequately account for all the relevant background characteristics. Moreover, measuring adult socioeconomic status at one point in time may not give a thorough picture of women's socioeconomic status over the life course. For instance, measuring unemployment at one point in time does not tell whether these women experienced frequent unemployment spells or whether that was a short-term

one-off experience. As women who experienced more than one pregnancy as teenagers were excluded from the study, the estimates of mediation through teen pregnancy are conservative. Income was measured at individual level, although household level might be a better indicator of the available resources.

Despite these limitations, the strengths of the study ensure the results are of interest internationally. Since the data were collected from administrative registers, there was no underreporting of abortion which is common in surveys (Jones and Kost 2007), nor attrition which is common in longitudinal studies. The methods were innovative. This is the first study to show how teen births and abortions mediate the association from parental to own socioeconomic position using a reliable longitudinal dataset of three cohorts of women.

Since the effect of teenage childbearing on educational attainment is likely to be causal (e.g. Kane et al. 2013), policy-makers should facilitate educational enrolment of teenage mothers who want to continue their education to reduce accumulation of disadvantage. Future studies should investigate which barriers young mothers face in accessing education.

7. Conclusions

This thesis was motivated by the lack of longitudinal research in social sciences on abortion. Longitudinal studies on abortion are rare because high quality longitudinal data on abortion is often not available. Although Finnish abortion registers are one of the few resources in the world from where reliable information on abortion can be obtained and linked to other administrative registers, these data have not been fully exploited in abortion research (Gissler 2010). Moreover, research on reproductive health issues is often overlooked in high-income countries with low abortion and teen pregnancy rates. The aim of this thesis was to fill this gap in the literature by using Finnish register data on three cohorts of women to study the socio-demographic risk factors associated with the likelihood of abortion over the life course. In this thesis I aimed to show that although abortion rates in Finland are lower than in most other countries (Sedgh et al. 2013), there are growing socioeconomic differences in these aspects.

The advantage of longitudinal data is that it allows studying abortion from the life course perspective. Events and experiences throughout the life course affect women's fertility intentions and decision-making regarding unintended pregnancies and pregnancy termination (Elder, Kirkpatrick, and Crosnoe 2003; Giele and Elder 1998). The decision to obtain an abortion may be due to a combination of unconscious schemas affecting attitudes towards abortions and childbearing (Johnson-Hanks et al. 2011), the number and age of existing children (Hansen et al. 2009; Jones, Darroch, and Henshaw 2002; Rasch et al. 2007; Regushevskaya et al. 2009), plans regarding future career (Johnson-Hanks et al. 2011), economic concerns (Finer et al. 2005), romantic relationships (Bankole, Singh, and Haas 1998; Chibber et al. 2014; Finer et al. 2005; Kirkman et al. 2009) or a combination of these. Complex factors from the micro- and macro- levels affect the decision to terminate a pregnancy (Coast, Norris, and Freeman 2015).

Below I first summarise the main findings of the thesis before discussing its main limitations and the impact of these limitations on the result and design of this piece of research. Finally, I outline the policy implications arising from the results and list directions for future research.

7.1 Summary of findings

The starting point of this thesis was to study the socioeconomic characteristics among adult women associated with the likelihood of obtaining one's first abortion. Then I moved onto

studying the characteristics associated with the likelihood of subsequent abortions. After modelling how the likelihood of abortion changes depending on the type and length of romantic relationships, I moved onto investigating the socioeconomic pathways of women with different teenage pregnancy histories.

Chapters 3 and 4, which focused on the educational and other socioeconomic characteristics associated with the risk of first and subsequent abortions, show that despite the relatively low abortion rates among the female population in Finland, there were growing differences in the likelihood of abortion by education. Women with low education had a higher risk of first and repeat abortion than women with high education, and the gap was wider among the cohorts born in the 1970s than among the cohorts born in the 1950s. It is likely that some of the effect was due to the expansion of education in the Finnish society (Official Statistics of Finland 2015) resulting in a different population being selected into the group with low education than was the case for earlier cohorts. This was supported by the findings in sections *3.1.5 Results: Occupational group and abortion* and *3.2 Labour force participation and the likelihood of abortion*; the differences in the likelihood of abortion by occupational group or labour force status did not grow to the same extent as they did for education. However, it is unlikely that selection into education would be the sole mechanism behind these differences. Differences in access to family planning services and patterns of contraceptive use are likely to be important determinants in the likelihood of unintended pregnancies, and subsequently abortions.

The results in Chapter 4 *Educational inequalities in repeat abortion* showed that women with low education had higher likelihood of repeat abortion, obtained repeat abortions sooner after the preceding abortion than women with middle or high education level. Also other characteristics, such as parity, age and relationship status had more to do with the likelihood of repeat abortion among women with low education than among women with high education, for whom these characteristics were in most cases not associated with the likelihood of repeat abortion. The shorter time between abortions among women with low education compared to women with high education may be a sign of the former group not benefitting from post-abortion counselling to the same extent as the latter. Moreover, the same mechanisms causing educational differences in the likelihood of first abortion (selection into education and differences in access to family planning services and consistency of contraceptive use) probably explain a part of these findings. To the best of my knowledge this study is the most comprehensive study conducted on repeat abortion.

Other studies have had to rely on smaller sample sizes and shorter follow-up times (Heikinheimo, Gissler, and Suhonen 2008; Makenzius et al. 2011; Mentula et al. 2010; Niinimäki et al. 2009; Osler, David, and Morgall 1997; Stone and Ingham 2011; Väisänen and Jokela 2010). Moreover, many of the previous studies used survey data (Jones et al. 2006; Makenzius et al. 2011; Stone and Ingham 2011), which is problematic, as studies on repeat abortion are the ones to suffer most severely from underreporting of abortion (Jones and Kost 2007), and therefore my study makes an important contribution in the field.

The study reported in Chapter 5 *Timing of abortions, births and relationship transitions in Finland* examined how the decision-making processes of abortions, births and union dissolutions are intertwined. It is to the best of my knowledge the first one to study all these three processes jointly. Previous studies have investigated union transitions and timing of births jointly (Aassve et al. 2006; Leone and Hinde 2007; Lillard 1993; Lillard and Waite 1993; Steele et al. 2005), but they have not been able to include abortions due to lack of appropriate data. The results of the study showed that women with above-average risk of union dissolution also had an above-average risk of abortion. It may be that these women lead less stable lives overall than those with fewer union dissolutions. This instability may have led to inconsistencies in contraceptive use, which is associated with a higher likelihood of unintended pregnancy, and subsequently of abortion. Interestingly, the same association was not found between the risk of birth and union dissolution indicating that people with more unions tend not to have higher fertility in Finland, although in some other countries that is the case because the partners want to show commitment to each other by having a child together (Balbo, Billari, and Mills 2013). The risk of abortion also varied depending on the length and type of romantic relationship. Among married people the risk was low throughout the marriage, whereas women in cohabiting unions had a higher likelihood of abortions than married women in the first few years of their relationships. The results highlight the importance of romantic relationships on the decision-making regarding abortion: cohabiting unions seem to become similar to marriages in terms of abortion decision-making after the early years of the union. This is consistent with previous literature on how the differences between the two types of unions decline over time (e.g. Perelli-Harris et al. 2014).

In Chapter 6 *Adolescent births, abortions and the pathway from parental to own socioeconomic position* I reported a study on the socioeconomic pathways women take given their socioeconomic background and teen pregnancy experiences. In this study I found that

teen births mediated the association from parental to own socioeconomic position at the population level, but teen abortions did not. Young mothers ended up with lower income and a higher chance of unemployment than those who did not become young mothers, largely due to their lower level of education at age 30. Although those who had a teen abortion had a lower socioeconomic position in their early 30s than those who did not experience a teen pregnancy, it was due to the impact of their socioeconomic background and childbearing in their early 20s, as teen abortion did not mediate the association between parental and own socioeconomic position. The study is the first one of this topic to use the KHB method, and it differs from many previous studies in that it did not try to separate the 'effect of teen pregnancy' from the broader context of women's lives. Thus, it provides a different point of view from many previous studies on teen pregnancy, which have focused only on teasing out the causal effect of teen childbearing (Geronimus and Korenman 1992; Hoffman, Foster, and Furstenberg Jr. 1993; Kane et al. 2013; Lee 2010). Furthermore, the study is exceptional in being able to compare teen births and abortions, as few previous studies have been able to take teen abortions into account (Fergusson, Boden, and Horwood 2007; Olsson et al. 2014).

Taken together, the results suggest that socioeconomic characteristics and relationship situation are important determinants of pregnancy decision-making in Finland. The strength of these associations and the growing gaps between educational groups were surprising, given the social-democratic ethos of the country, which has resulted in support for families, free education, and attempting to provide universal family planning services. Although Finland's abortion and teen pregnancy rates are relatively low, policy-makers and researchers should not ignore the group of women which seems to have been left behind when it comes to family planning and its determinants.

7.2 Study limitations

As discussed in Chapter 2 *Data and Methods* as well as the substantive chapters from 3 to 6, the most important limitations of the thesis arise from the type of variables lacking from administrative registers; or in some cases variables that are available in the registers, but which could not be included in my dataset due to ethics regulations and personal data protection. These limitations do not compromise the objective of the thesis, which was to conduct a longitudinal study of a topic difficult to capture using other types of data, but they ruled out studying causal relations and extensive theory building. Although register data

enable studying the socio-demographic risk factors of abortion, they do not tell much about the individual's decision-making process, as highlighted below.

There was no information about sexual and reproductive health behaviours in my dataset. For instance, contraceptive use, fertility intentions, or use of family planning services were not known, although this information would have been helpful in unmasking the mechanisms behind the socioeconomic differences in the likelihood of abortion. Women who do not use contraceptives at all or use the methods inconsistently are at a risk of experiencing an unintended pregnancy. The consistency of the use is in part dependent on timely access to high-quality family planning services (Frost, Singh, and Finer 2007; Hemminki et al. 1997), but no information on these women's access to the services was available. Furthermore, as fertility intentions were not recorded, I did not know which of the births observed in the dataset were unintended or unwanted. More knowledge of the implications of obtaining an abortion could have been extracted by comparing those who had an abortion to those who carried an unwanted pregnancy to term (Biggs, Gould, and Foster 2013; Chibber et al. 2014), but that is not possible with register data. Lastly, attitudes towards abortion may affect some women's abortion decision-making (Johnson-Hanks et al. 2011), but those were not known either.

Another piece of useful information, which is not available in the registers, is the reasons women give for obtaining an abortion, beyond the official 'indication for abortion' required by law. Knowing the reasons women give for terminating a pregnancy would have helped in understanding more in depth the situations in life in which women are more likely to choose an abortion and to contribute to theory building around the issue.

Some of the information not available in the registers was not directly related to sexual and reproductive health issues, but would have helped me to draw more in-depth conclusions about the decision-making around abortion, and timing of entry to parenthood in particular among those who became young mothers. For example, women's career and education plans would have shed light on the issue of why some of them decided to enter parenthood in adolescence, whereas others chose an abortion or did not experience any pregnancies until later in life.

Finally, no information about the partners of those who were in a romantic relationship was available in my dataset. Although it would have been possible to extract some socioeconomic and demographic information about them from registers, the ethics

regulations made it challenging. It would have been interesting to test to what extent the likelihood of abortion differs depending on partner's characteristics. For instance, whether socioeconomic characteristics of the partner (such as education, labour force participation status, and income) seem to matter when women make abortion decisions, or whether they only consider their own economic situation. Perhaps women, whose partner has a secure job, consider the costs of childbearing differently from women, whose partner is unemployed, or from single women, all else equal. This could subsequently have an effect on their likelihood of abortion. Likewise, in addition to considering women's own previous births and abortions in relation to their likelihood of abortion such as in Chapter 5, I could have studied the effect of the timing and number of births of partner's children from earlier relationships. Moreover, registers do not contain information about the role of the partner in making the decision to terminate a pregnancy, or about how the partners see the future of their relationship despite these being important factors in abortion decision-making (Bankole, Singh, and Haas 1998; Chibber et al. 2014; Finer et al. 2005; Kirkman et al. 2009).

The limitations outlined above are difficult to overcome in a study of abortion. In most cases surveys and qualitative research are the only data collection efforts that can overcome these limitations. The problem with surveys is getting representative information on abortion (Jones and Kost 2007). By conducting studies using different types of data suffering from different shortcomings we can, however, accumulate knowledge and understanding of abortion.

7.3 Policy implications

There are two key mechanisms which are of interest to policy-makers and which are likely to contribute to the differences in the likelihood of experiencing unintended pregnancies, and subsequently abortions, depending on women's education, labour market position, and relationship stability. First of all, despite Finland's attempts to provide universal access to family planning services (Hemminki et al. 1997; Kosunen 2000), it seems that there are groups of women who struggle to get timely access to family planning clinics and contraceptives. It is possible that their choice of contraceptive methods is limited due to the costs of some of the methods. Second, women may have different levels of knowledge regarding how to use contraceptives.

One of the most important policy implications arising from this thesis is the need to evaluate and improve the use of and access to family planning services. Chapters 3 and 4

showed the growing educational gap in the likelihood of obtaining first and subsequent abortions. Chapter 6 showed that the pathway from lower socioeconomic position to teen births and abortions is strong in Finland. Women with fewer financial resources may not be able to access family planning services in a timely manner because of the long waiting times in public clinics and the expensive costs of private clinics (Hemminki et al. 1997). Long waiting periods may result in women becoming pregnant before the appointment, as suggested by a study on the contraceptive use of young Norwegian women (Sundby, Svanemyr, and Mæhre 1999). Chapter 5 showed that women with unstable relationships, and perhaps with less stable lives overall, had an elevated risk of abortion. Women should be able to access contraceptive counselling in a timely manner while going through profound changes, such as partnership dissolution, in their lives.

Some women may struggle to pay for contraceptives. A study in the United States showed that disadvantaged women were more likely to use less effective methods, such as condoms, and report that although they would have liked to switch methods, they could not due to the high cost of the alternatives (Frost and Darroch 2008). Although the costs are lower in Finland than in the United States, providing contraceptives for free would ensure that everyone could obtain the method they wish. A study in the United States showed that providing contraceptives for free increased the use of the most effective methods (Winner et al. 2012), which is likely to reduce unintended pregnancy levels. Given the current difficult economic situation in Finland, which has led to an increase in unemployment (Official Statistics of Finland 2015) and into austerity measures reducing the size of the public sector (Khan 2015; YLE News 2015), evaluating and improving the family planning services is important. It has been shown that unintended pregnancies create considerable costs to the health care system, for example in the United States (Trussell 2007), and this is likely to be the case in Finland as well. Ensuring easy access to family planning services to all women is one way of reducing the risk of unintended pregnancy and the costs it creates.

The results in Chapter 4 showed that women with low education level obtained repeat abortions sooner after the initial abortion than women with middle or high education. It may be that they do not benefit from post-abortion counselling to the same extent as women with more education. In Finland, women are asked to attend a post-abortion follow-up visit in their primary health care centre in up to one month after the operation, which may be too long of a gap. According to a survey conducted in the mid-1990s, 86 per cent of women attended the follow-up visit (Sihvo et al. 1998). The same study found that a half of the

women who had an abortion had not used contraceptives when they got pregnant, indicating a need for contraceptive counselling among women obtaining abortions in Finland (Sihvo et al. 1998). Promoting the use of long acting reversible contraceptives (LARCs), such as IUDs and implants, has been shown to be an effective way to reduce repeat abortions in Finland (Heikinheimo, Gissler, and Suhonen 2008; Pohjoranta et al. 2015), Canada (Ames and Norman 2012), and New Zealand (Roberts, Silva, and Xu 2010; Rose and Lawton 2012). Thus, making sure women attend post-abortion counselling as soon as possible after the operation, and providing LARCs, may help some women to avoid unintended pregnancies and subsequently abortions.

Chapter 6 touched upon the issues of teenage pregnancy and how lower socioeconomic background is associated with early entry to parenthood. It may be that a part of the higher likelihood of teen pregnancy among women from less advantaged backgrounds is due to differences in knowledge of contraceptive methods. In Finland, it is compulsory for all schools to provide sex education (Kontula 2010). This policy was temporarily abolished in the late 1990s resulting in a peak in the teen abortion rate (Heino, Gissler, and Soimula 2011; Kontula 2010). It shows the importance of providing such education. However, it may be that adolescents who struggle in school do not benefit from sex education in school as much as others. Furthermore, ordinary school teachers may not know enough of contraceptive methods to teach about possible side effects or other concerns young women may have regarding contraception, as suggested by a study in Norway (Sundby, Svanemyr, and Mæhre 1999). Thus, there is a need for additional channels of distributing information on contraceptive use and sexuality. Internet-based programmes and involvement of parents have been suggested as possible outlets in the United States (Brown, Keller, and Stern 2009; Shtarkshall, Santelli, and Hirsch 2007), and it could be efficient in Finland as well. Obtaining a good understanding of contraceptive use and other sexual and reproductive health in adolescence is likely to contribute to knowledge of these issues also in adulthood.

Finally, Chapter 6 also showed that most of the mediation from becoming a young mother into a lower socioeconomic position later in life travelled through education. The barriers these women face in completing education should be evaluated and appropriate policy measures put in place, whether that means help with childcare, career planning, a combination of both, or other relevant strategies. Helping young mothers to complete their desired level of education may improve their chances of getting stable employment and a

higher salary, which in turn brings financial stability and helps them provide for their children.

7.4 Future research agenda

There are a number of areas that could be explored in future research by building on the findings of this thesis. Some of these would address the limitations of this study. I have outlined the most important directions for future research below.

There is a need to conduct a population level survey in Finland investigating contraceptive use patterns, access to family planning services, and fertility intentions. At the moment, data on contraceptive use is either outdated or ignores significant parts of the population (Hemminki et al. 1997; Koponen et al. 2012; Kosunen et al. 2004; Makkonen and Hemminki 1991) and the level of unintended pregnancy in Finland is not known, as the few studies that exist, have given conflicting estimates (Pouta et al. 2005; Rantakallio and Myhrman 1990; Singh, Sedgh, and Hussain 2010). Given in this thesis I have shown that there is a growing gap in the risk of abortion between women with low and high education, it would be important to know why there seems to be such a big difference in the contraceptive use patterns between these groups, and whether those patterns are associated with women's fertility intentions. Previous studies in other countries have shown that ambivalent pregnancy attitudes are associated with less effective contraceptive use (Frost, Singh, and Finer 2007; Moreau et al. 2013).

There is also a need for research on reasons women give for abortions in Finland. In addition to interviewing women themselves, a more thorough picture could be achieved if also the man involved in the pregnancy was interviewed. At the moment we do not know whether the reasons in Finland are similar to those reported in other countries, such as the United States, where economic concerns, the number and age of existing children, problems in a romantic relationship, and the lack of a suitable partner are commonly cited reasons for abortions (Bankole, Singh, and Haas 1998; Chibber et al. 2014; Finer et al. 2005; Kirkman et al. 2009).

The results of this thesis show that an important reason why young mothers had a lower socioeconomic position than older mothers or childless women was their lower educational level. There is a need to evaluate whether that is due to selection of those who do not wish to obtain any further education into early motherhood, due to barriers making it difficult for young mothers to study, or a combination of both. Studies in the UK suggest

that women who think they cannot access higher education are more likely to choose to start childbearing early (Smith and Roberts 2011), but it may not be the case in Finland, where education is free at all levels, and affordable day-care for children is easily available (Vikat 2004). Thus in theory, everyone should have equal access to education regardless of their background and family composition, but it has been shown that parents' educational level plays an important role in determining that of their children (Erola 2009). Future research could compare the fertility and career intentions of women who experienced an abortion, a birth, or no pregnancy in adolescence in order to examine the differences between their motivations to choose these different pathways in life.

In this thesis I presented a case study of Finland, and therefore it was not possible to show whether the results would be similar in other countries. As outlined in section 1.4 *The Finnish context*, Finland is in many ways an exceptional country in the high level of support it provides for families and in its attempts to provide universal reproductive health services. Thus, it is difficult to say whether the observed socioeconomic trends in the likelihood of abortion would be similar in countries with a higher level of inequality, such as the United States or the UK. Even some of the Nordic countries, which are supposedly similar to Finland in terms of culture and policy-making, have different abortion trends. In Sweden, the abortion rates have been more than twice as high as those in Finland for the past 35 years (Heino and Gissler 2013). In the future, researchers should conduct international comparisons of the socioeconomic and demographic characteristics associated with abortion and how these trends have changed over time. The main challenge of conducting a study of this type is the lack of reliable and harmonised data on abortion. New data collection efforts are thus needed.

Finally, a rich but underused source of data in Finland is a combination of surveys and register data. To the best of my knowledge no one has conducted a nationwide research project studying abortion and other reproductive health behaviours using surveys combined with register data. If the surveys I listed above were conducted and permission from participants to link these data to the abortion register was obtained, a study project overcoming many of the limitations of all other studies on abortion could be conducted. It would also provide a unique opportunity to study the determinants of underreporting of abortion in surveys, as it would be known which abortions were not reported and which groups of women were less likely to report them.

The main contribution of the thesis was to provide a detailed description of a phenomenon which is difficult to capture with most of the standard data collection efforts, such as surveys. This is the first time abortion has been studied using such a long follow-up period (ages 15–50 and years 1970–2010) and three cohorts of women. It also provided fresh methodological insights with the KHB method and the multi-process modelling techniques. It used the rich and underused data source of Finnish population registers (Gissler 2010) to achieve these aims. However, the study has raised many questions while attempting to solve others signposting the above mentioned directions for future research on abortion.

8. References

Aassve, A., Burgess, S., Propper, C., & 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.

Alouini, S., Uzan, M., Méningaud, J. P., & Hervé, C. (2002). Knowledge about contraception in women undergoing repeat voluntary abortions, and means of prevention. *European Journal of Obstetrics & Gynecology and Reproductive Biology*, *104*(1), 43–48. doi:10.1016/S0301-2115(02)00060-X

Ames, C. M., & Norman, W. V. (2012). Preventing repeat abortion in Canada: is the immediate insertion of intrauterine devices postabortion a cost-effective option associated with fewer repeat abortions? *Contraception*, *85*(1), 51–55. doi:10.1016/j.contraception.2011.05.002

Andersson, G., Rønsen, M., Knudsen, L. B., Lappegård, T., Neyer, G., Skrede, K., et al. (2009). Cohort Fertility Patterns in the Nordic Countries. *Demographic Research*, *20*, 313–352. doi:10.4054/DemRes.2009.20.14

Anger, S. (2012). Intergenerational transmission of cognitive and nongignitive skills. In J. Ermisch, M. Jäntti, & T. M. Smeeding (Eds.), *From Parents to Children: The Intergenerational Transmission of Advantage* (pp. 393–421). New York: Russell Sage Foundation.

Appelqvist, J. (2008). *Teollisuuden toimialakatsaus I/2008. [The industrial sector review I/2008]* (No. I/2008). Helsinki: Statistics Finland. http://www.stat.fi/artikkelit/2008/art_2008-06-27_001.html?s=0. Accessed 13 June 2016

Ashcraft, A., Fernández-Val, I., & Lang, K. (2013). The Consequences of Teenage Childbearing: Consistent Estimates When Abortion Makes Miscarriage Non-random. *The Economic Journal*, *123*(571), 875–905. doi:10.1111/ecoj.12005

Assini-Meytin, L. C., & Green, K. M. (2015). Long-Term Consequences of Adolescent Parenthood Among African-American Urban Youth: A Propensity Score Matching Approach. *Journal of Adolescent Health*, *56*(5), 529–535. doi:10.1016/j.jadohealth.2015.01.005

Balbo, N., Billari, F. C., & 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., & 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

Barber, J. S. (2001). The Intergenerational Transmission of Age at First Birth among Married and Unmarried Men and Women. *Social Science Research*, *30*(2), 219–247. doi:10.1006/ssre.2000.0697

Barrett, G., & Wellings, K. (2002). What is a "planned" pregnancy? Empirical data from a British study. *Social Science & Medicine*, *55*(4), 545–557. doi:10.1016/S0277-9536(01)00187-3

Becker, G. S. (1991). *A treatise on the family* (Enlarged ed.). Cambridge, Mass, London: Harvard University Press.

Belsky, J., Steinberg, L., & Draper, P. (1991). Childhood Experience, Interpersonal Development, and Reproductive Strategy: An Evolutionary Theory of Socialization. *Child Development*, *62*(4), 647–670. doi:10.2307/1131166

Bender, S., Geirsson, R. T., & Kosunen, E. (2003). Trends in teenage fertility, abortion, and pregnancy rates in Iceland compared with other Nordic countries, 1976-99. *Acta obstetricia et gynecologica Scandinavica*, *82*(1), 38–47.

Berg, V., Rotkirch, A., Väisänen, H., & 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

Biggs, M., Gould, H., & Foster, D. (2013). Understanding why women seek abortions in the US. *BMC Women's Health*, *13*(29), 1–13.

Björklund, A., & Jäntti, M. (2009). Intergenerational Income Mobility and the Role of Family Background. In W. Salverda, B. Nolan, & T. M. Smeeding (Eds.), *The Oxford handbook of Economic Inequality* (pp. 491–521). Oxford; New York: Oxford University Press.

Björklund, A., Jäntti, M., & Nybom, M. (2012). Parental Education Gradients in Sweden. In J. Ermisch, M. Jantti, & T. M. Smeeding (Eds.), *From Parents to Children: The Intergenerational Transmission of Advantage* (pp. 393–421). New York: Russell Sage Foundation.

Björklund, A., Jäntti, M., & Solon, G. (2007). Nature and Nurture in the Intergenerational Transmission of Socioeconomic Status: Evidence from Swedish Children and Their Biological and Rearing Parents. *The B.E. Journal of Economic Analysis & Policy*, *7*(2), 1–23.

Blanden, J., & Machin, S. (2004). Educational Inequality and the Expansion of UK Higher Education. *Scottish Journal of Political Economy*, *51*(2), 230–249. doi:10.1111/j.0036-9292.2004.00304.x

Blane, D., Netuveli, G., & Stone, J. (2007). The development of life course epidemiology. *Revue d'Épidémiologie et de Santé Publique*, *55*(1), 31–38. doi:10.1016/j.respe.2006.12.004

Bongaarts, J. (1978). Framework for Analyzing Proximate Determinants of Fertility. *Population and Development Review*, *4*(1), 105–132. doi:10.2307/1972149

Bongaarts, J., & Westoff, C. F. (2000). The Potential Role of Contraception in Reducing Abortion. *Studies in Family Planning*, *31*(3), 193–202. doi:10.1111/j.1728-4465.2000.00193.x

Bowles, S., & Gintis, H. (2002). The Inheritance of Inequality. *The Journal of Economic Perspectives*, *16*(3), 3–30. doi:10.1257/089533002760278686

Breen, R., Karlson, K. B., & Holm, A. (2013). Total, Direct, and Indirect Effects in Logit and Probit Models. *Sociological Methods & Research*, *42*(2), 164–191. doi:10.1177/0049124113494572

Breen, R., Luijkx, R., Müller, W., & Pollak, R. (2009). Nonpersistent inequality in educational attainment: evidence from eight European countries. *AJS; American journal of sociology*, *114*(5), 1475–1521.

Brown, J. D., Keller, S., & Stern, S. (2009). Sex, Sexuality, Sexting, and SexEd: Adolescents and the Media. *Prevention Researcher*, *16*(4), 12–16.

Browne, W. J. (2009). *MCMC Estimation in MLwiN v2.1*. 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., & 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

Buis, M. L. (2010). Direct and indirect effects in a logit model. *The Stata journal*, *10*(1), 11–29.

Caliendo, M., & Kopeinig, S. (2008). Some Practical Guidance for the Implementation of Propensity Score Matching. *Journal of Economic Surveys*, *22*(1), 31–72. doi:10.1111/j.1467-6419.2007.00527.x

Center for Reproductive Rights. (2015). The World's Abortion Laws. http://worldabortionlaws.com/. Accessed 11 February 2016

Chen, Z., & Roy, K. (2009). Calculating concentration index with repetitive values of indicators of economic welfare. *Journal of Health Economics*, *28*(1), 169–175. doi:10.1016/j.jhealeco.2008.09.004

Chevalier, A., & Viitanen, T. K. (2003). The long-run labour market consequences of teenage motherhood in Britain. *Journal of Population Economics*, *16*(2), 323–343. doi:10.1007/s001480200125

Chibber, K. S., Biggs, M. A., Roberts, S. C. M., & 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

Cleland, K., Peipert, J. F., Westhoff, C., Spear, S., & Trussell, J. (2011). Family planning as a cost-Saving preventive health service. *New England Journal of Medicine*, *364*(18), e37. doi:10.1056/NEJMp1104373

Coast, E., Norris, A., & Freeman, E. (2015). Trajectories to Abortion and Abortion-Related Care: A Conceptual Framework. Presented at the Population Association of America annual meeting, San Diego, CA. http://paa2015.princeton.edu/abstracts/150461. Accessed 18 February 2016

Current Care Guidelines. (2013). Raskaudenkeskeytys [Induced abortion]. http://www.kaypahoito.fi/web/kh/suositukset/suositus?id=hoi27050. Accessed 11 February 2016

Das, S., Adegbenro, A., Ray, S., & Amu, O. (2009). Repeat abortion: facts and issues. *Journal of Family Planning and Reproductive Health Care*, *35*(2), 93–95. doi:10.1783/147118909787931915

Denisov, B. P., Sakevich, V. I., & Jasilioniene, A. (2012). Divergent Trends in Abortion and Birth Control Practices in Belarus, Russia and Ukraine. *PLoS ONE*, *7*(11), e49986. doi:10.1371/journal.pone.0049986

Devine, F., & Li, Y. (2013). The changing relationship between origins, education and destinations in the 1990s and 2000s. *British Journal of Sociology of Education*, *34*(5–06), 766–791. doi:10.1080/01425692.2013.816039

Diaz, C. J., & Fiel, J. E. (2016). The Effect(s) of Teen Pregnancy: Reconciling Theory, Methods, and Findings. *Demography*, *53*(1), 85–116. doi:10.1007/s13524-015-0446-6

Driscoll, A. (2014). Adult outcomes of teen mothers across birth cohorts. *Demographic Research*, *30*, 1277–1292. doi:10.4054/DemRes.2014.30.44

Ekstrand, M., Tydén, T., Darj, E., & Larsson, M. (2009). An Illusion of Power: Qualitative Perspectives On Abortion Decision-Making Among Teenage Women In Sweden. *Perspectives on Sexual and Reproductive Health*, *41*(3), 173–180. doi:10.1363/4117309

Elder, G. H., Kirkpatrick, M., & Crosnoe, R. (2003). The Emergence and Development of Life Course Theory. In *Handbook of the life course* (pp. 3–19). New York: Kluwer Academic Publishers.

Ellison, C. G., Echevarría, S., & 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

Erola, J. (2009). Social Mobility and Education of Finnish Cohorts Born 1936—75 Succeeding While Failing in Equality of Opportunity? *Acta Sociologica*, *52*(4), 307–327. doi:10.1177/0001699309348701

Erreygers, G., & Van Ourti, T. (2011). Measuring socioeconomic inequality in health, health care and health financing by means of rank-dependent indices: A recipe for good practice. *Journal of Health Economics*, *30*(4), 685–694. doi:10.1016/j.jhealeco.2011.04.004

Fergusson, D. M., Boden, J. M., & Horwood, L. J. (2007). Abortion among young women and subsequent life outcomes. *Perspectives on sexual and reproductive health*, *39*(1), 6–12. doi:10.1363/3900607

Fiel, J. E., Haskins, A. R., & Turley, R. N. L. (2013). Reducing School Mobility A Randomized Trial of a Relationship-Building Intervention. *American Educational Research Journal*, *50*(6), 1188–1218. doi:10.3102/0002831213499962

Finer, L. B., Frohwirth, L. F., Dauphinee, L. A., Singh, S., & 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

Finer, L. B., & Zolna, M. R. (2011). Unintended pregnancy in the United States: incidence and disparities, 2006. *Contraception*, *84*(5), 478–485. doi:10.1016/j.contraception.2011.07.013

FINLEX. (1999). Primary Health Care Act: 66/1972, English translation. http://www.finlex.fi/en/laki/kaannokset/1972/en19720066?search%5Btype%5D=pika&search%5Bpika%5D=health%20care. Accessed 21 January 2016

FINLEX. (2013). Laki raskauden keskeyttämisestä [Act on pregnancy termination] 24.3.1970/239. http://www.finlex.fi/fi/laki/ajantasa/1970/19700239. Accessed 4 March 2013

Font-Ribera, L., Pérez, G., Salvador, J., & Borrell, C. (2007). Socioeconomic Inequalities in Unintended Pregnancy and Abortion Decision. *Journal of Urban Health*, *85*(1), 125–135. doi:10.1007/s11524-007-9233-z

Forssén, K., Laukkanen, A.-M., & Ritakallio, V.-M. (2003). Policy. The case of Finland. Presented at the Welfare Policy and Employment in the Context of Family Change, Utrecht. https://www.york.ac.uk/inst/spru/research/nordic/finlandpoli.pdf

Frejka, T., & 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

Frost, J. J., & Darroch, J. E. (2008). Factors Associated with Contraceptive Choice and Inconsistent Method Use, United States, 2004. *Perspectives on Sexual and Reproductive Health*, *40*(2), 94–104. doi:10.1363/4009408

Frost, J. J., Finer, L. B., & Tapales, A. (2008). The Impact of Publicly Funded Family Planning Clinic Services on Unintended Pregnancies and Government Cost Savings. *Journal of Health Care for the Poor and Underserved*, *19*(3), 778–796. doi:10.1353/hpu.0.0060

Frost, J. J., Singh, S., & Finer, L. B. (2007). Factors Associated with Contraceptive Use and Nonuse, United States, 2004. *Perspectives on Sexual and Reproductive Health*, *39*(2), 90–99. doi:10.1363/3909007

Frost, J. J., Sonfield, A., Zolna, M. R., & Finer, L. B. (2014). Return on investment: a fuller assessment of the benefits and cost savings of the US publicly funded family planning program. *The Milbank Quarterly*, *92*(4), 696–749. doi:10.1111/1468-0009.12080

Geronimus, A. T., & Korenman, S. (1992). The Socioeconomic Consequences of Teen Childbearing Reconsidered. *The Quarterly Journal of Economics*, *107*(4), 1187–1214. doi:10.2307/2118385

Giele, J. Z., & Elder, G. H. (1998). Life Course Research: Development of a Field. In J. Z. Giele & G. H. Elder (Eds.), *Methods of life course research: qualitative and quantitative approaches*. Thousand Oaks; London; New Delhi: Sage.

Gilks, W. R., Richardson, S., & Spiegelhalter, D. J. (1996). Introducing Markov Chain Monte Carlo. In W. R. Gilks, S. Richardson, & D. J. Spiegelhalter (Eds.), *Markov Chain Monte Carlo in Practice* (pp. 1–19). Boca Raton: Springer.

Gipson, J. D., Koenig, M. A., & Hindin, M. J. (2008). The Effects of Unintended Pregnancy on Infant, Child, and Parental Health: A Review of the Literature. *Studies in Family Planning*, *39*(1), 18–38. doi:10.1111/j.1728-4465.2008.00148.x

Gissler, M. (2010). Registration of Births and Induced Abortions in the Nordic Countries. *Finnish Yearbook of Population Research*, *XLV*, 171–178.

Gissler, M., Berg, C., Bouvier-Colle, M. H., & Buekens, P. (2004). Pregnancy-associated mortality after birth, spontaneous abortion, or induced abortion in Finland, 1987-2000. *American Journal of Obstetrics and Gynecology*, *190*(2), 422–427. doi:10.1016/j.ajog.2003.08.044

Gissler, M., & Heino, A. (2011). *Induced abortions in the Nordic countries 2009*. Helsinki: National Institute for Health and Welfare. http://www.thl.fi/tilastoliite/tilastoraportit/2011/Tr09_11.pdf. Accessed 15 January 2013

Gissler, M., & Shelley, J. (2002). Quality of data on subsequent events in a routine Medical Birth Register. *Medical informatics and the Internet in medicine*, *27*(1), 33–38. doi:10.1080/14639230110119234

Gissler, M., Ulander, V.-M., Hemminki, E., & Rasimus, A. (1996). Declining Induced Abortion Rate in Finland: Data Quality of the Finnish Abortion Register. *International Journal of Epidemiology*, *25*(2), 376–380. doi:10.1093/ije/25.2.376

Goldthorpe, J. H. (2000). *On sociology: numbers, narratives, and the integration of research and theory*. Oxford [UK] ; New York: Oxford University Press.

Grunloh, D. S., Casner, T., Secura, G. M., Peipert, J. F., & Madden, T. (2013). Characteristics associated with discontinuation of long-acting reversible contraception within the first 6 months of use. *Obstetrics and gynecology*, *122*(6), 1214–1221. doi:10.1097/01.AOG.0000435452.86108.59

Haataja, A. (2006). *Nordic breadwinner–caretaker models - comparison of Finland and Sweden* (No. 43). Helsinki: the Ministry of Social Affairs and Health. http://www.stm.fi/c/document_library/get_file?folderId=28707&name=DLFE-3693.pdf&title=Pohjoismainen_ansaitsija_hoivaajamalli_fi.pdf

Hallqvist, J., Lynch, J., Bartley, M., Lang, T., & Blane, D. (2004). Can we disentangle life course processes of accumulation, critical period and social mobility? An analysis of disadvantaged socio-economic positions and myocardial infarction in the Stockholm Heart Epidemiology Program. *Social Science & Medicine*, *58*(8), 1555–1562. doi:10.1016/S0277-9536(03)00344-7

Hansen, M.-L. H., Mølgaard-Nielsen, D., Knudsen, L. B., & 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., & Holland, K. (1999). Persistence and Change in Decisions to Remain Childless. *Journal of Marriage and Family*, *61*(2), 531–539.

Heikinheimo, O., Gissler, M., & Suhonen, S. (2008). Age, parity, history of abortion and contraceptive choices affect the risk of repeat abortion. *Contraception*, *78*(2), 149–154. doi:10.1016/j.contraception.2008.03.013

Heikinheimo, O., Gissler, M., & Suhonen, S. (2009). Can the outcome of the next pregnancy be predicted at the time of induced abortion? *Human Reproduction*, *24*(4), 820–826. doi:10.1093/humrep/den465

Heino, A., & Gissler, M. (2012). Induced abortions 2011. National Institute for Health and Welfare: Official Statistics of Finland. http://www.thl.fi/fi_FI/web/fi/tilastot/aiheittain/seliterveys/raskaudenkeskytykset/raskaudenkeskeytykset. Accessed 3 December 2012

Heino, A., & Gissler, M. (2013). *Induced abortions in the Nordic countries 2011*. Helsinki: National Institute for Health and Welfare. http://www.julkari.fi/handle/10024/104400. Accessed 19 September 2014

Heino, A., Gissler, M., & Soimula, A. (2011). Induced abortions 2010. National Institute for Health and Welfare: Official Statistics of Finland. http://www.thl.fi/fi_FI/web/fi/tilastot/aiheittain/seliterveys/raskaudenkeskytykset/raskaudenkeskeytykset. Accessed 3 December 2012

Hemminki, E., Klemetti, R., Sevón, T., & Gissler, M. (2008). Induced abortions previous to IVF: an epidemiologic register-based study from Finland. *Human Reproduction*, *23*(6), 1320–1323. doi:10.1093/humrep/den101

Hemminki, E., Sihvo, S., Koponen, P., & Kosunen, E. (1997). Quality of contraceptive services in Finland. *Quality and Safety in Health Care*, *6*(2), 62–68. doi:10.1136/qshc.6.2.62

Hess, J. A., & 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

Hinde, A. (1998). *Demographic methods*. London; New York: Arnold.

Ho, P. C. (2006). Women's perceptions on medical abortion. *Contraception*, *74*(1), 11–15. doi:10.1016/j.contraception.2006.02.012

Hoem, J. M., Jalovaara, M., & 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

Hoffman, S. D. (1998). Teenage Childbearing Is Not So Bad After All...Or Is It? A Review of the New Literature. *Family Planning Perspectives*, *30*(5), 236. doi:10.2307/2991610

Hoffman, S. D., Foster, E. M., & Furstenberg Jr., F. F. (1993). Reevaluating the Costs of Teenage Childbearing. *Demography*, *30*(1), 1–13. doi:10.2307/2061859

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

Honkanen, H., & von Hertzen, H. (2002). Users' perspectives on medical abortion in Finland. *Contraception*, *65*(6), 419–423. doi:10.1016/S0010-7824(02)00295-0

Honkapohja, S., & Koskela, E. (1999). The economic crisis of the 1990s in Finland. *Economic Policy*, *14*(29), 399–436.

Hotz, V. J., McElroy, S. W., & Sanders, S. G. (2005). Teenage Childbearing and Its Life Cycle Consequences: Exploiting a Natural Experiment. *Journal of Human Resources*, *XL*(3), 683–715. doi:10.3368/jhr.XL.3.683

Hovde Lyngstad, T., & Skardhamar, T. (2011). Nordic Register Data and Their Untapped Potential for Criminological Knowledge. *Crime and Justice*, *40*(1), 613–645. doi:10.1086/658881

Hrdy, S. B. (1999). *Mother nature: natural selection and the female of the species*. London: Chatto & Windus.

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., & Kohler, H.-P. (2011). *Understanding Family Change and Variation*. Dordrecht: Springer Netherlands.

Jones, R. K., Darroch, J. E., & Henshaw, S. K. (2002). Patterns in the Socioeconomic Characteristics of Women Obtaining Abortions in 2000-2001. *Perspectives on Sexual and Reproductive Health*, *34*(5), 226–235. doi:10.2307/3097821

Jones, R. K., & Kost, K. (2007). Underreporting of Induced and Spontaneous Abortion in the United States: An Analysis of the 2002 National Survey of Family Growth. *Studies in Family Planning*, *38*(3), 187–197. doi:10.1111/j.1728-4465.2007.00130.x

Jones, R. K., Singh, S., Finer, L. B., & Frohwirth, L. (2006). *Repeat Abortion in the United States* (No. 29). New York: Guttmacher Institute. http://www.guttmacher.org/pubs/2006/11/21/or29.pdf

Kane, J. B., Morgan, S. P., Harris, K. M., & Guilkey, D. K. (2013). The Educational Consequences of Teen Childbearing. *Demography*, *50*(6), 2129–2150. doi:10.1007/s13524-013-0238-9

Karlson, K. B., & Holm, A. (2011). Decomposing primary and secondary effects: A new decomposition method. *Research in Social Stratification and Mobility*, *29*(2), 221–237. doi:10.1016/j.rssm.2010.12.005

KELA. (2012). Social Insurance Institution: Parental allowance. http://kela.fi/web/en/parental-leave_parental-allowance. Accessed 26 April 2013

KELA. (2013). Social Insurance Institution: Maternity Allowance. http://kela.fi/web/en/pregnancy_maternity-allowance. Accessed 26 April 2013

Kelhä, M. (2010). Vääränikäisiä äitejä? : Ikä ja äitiyden yhteiskunnalliset ehdot. [Mothers at a wrong age? Age and the social conditions of motherhood.]. *Nuorisotutkimus*, *28*(2), 70–75.

Keski-Petäjä, M. (2012). Abortion Wishes and Abortion Prevention – Women Seeking Legal Termination of Pregnancy During the 1950s and 1960s in Finland. *Finnish Yearbook of Population Research, XLVII*, 113–135.

Khan, M. (2015, May 27). Finland embarks on "painful" austerity blitz. *The Telegraph*. United Kingdom. http://www.telegraph.co.uk/finance/economics/11633816/Finland-embarks-on-painful-austerity-blitz.html. Accessed 20 January 2016

Kirkman, M., Rowe, H., Hardiman, A., Mallett, S., & 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

Klaukka, T. (2009). The Finnish database on drug utilisation. *Norsk Epidemiologi - Norwegian Journal of Epidemiology*, *11*(1), 19–22.

Klemetti, R., Gissler, M., Niinimäki, M., & Hemminki, E. (2012). Birth outcomes after induced abortion: a nationwide register-based study of first births in Finland. *Human Reproduction*, *27*(11), 3315–3320. doi:10.1093/humrep/des294

Knudsen, L. B., Gissler, M., Bender, S. S., Hedberg, C., Ollendorff, U., Sundström, K., et al. (2003). Induced abortion in the Nordic countries: special emphasis on young women. *Acta obstetricia et gynecologica Scandinavica*, *82*(3), 257–268.

Kohler, H.-P. (1997). Learning in Social Networks and Contraceptive Choice. *Demography*, *34*(3), 369. doi:10.2307/3038290

Kohler, U., Karlson, K. B., & Holm, A. (2011). Comparing Coefficients of Nested Nonlinear Probability Models. *Stata Journal*, *11*(3), 420–438.

Koistinen, M. (2008, January 23). Ehkäisyn hinta vaihtelee kympeistä satasiin vuodessa [The Price of Contraceptives Varies from Dozens to Hundreds of Euros per Year]. *Helsingin Sanomat*. http://www.hs.fi/artikkeli/Ehk%C3%A4isyn+hinta+vaihtelee+kympeist%C3%A4+satasiin+vuodessa/1135233486837. Accessed 23 April 2013

Konings, P., Harper, S., Lynch, J., Hosseinpoor, A. R., Berkvens, D., Lorant, V., et al. (2009). Analysis of socioeconomic health inequalities using the concentration index. *International Journal of Public Health*, *55*(1), 71–74. doi:10.1007/s00038-009-0078-y

Kontula, O. (2008). *Halu & intohimo. Tietoa suomalaisesta seksistä [Desire & Passion: A study of sexual behaviour in Finland]*. Helsinki: Otava.

Kontula, O. (2010). The evolution of sex education and students' sexual knowledge in Finland in the 2000s. *Sex Education*, *10*(4), 373–386.

Koponen, P., Klemetti, R., Luoto, R., Alha, P., & Surcel, H.-M. (2012). Raskauden ehkäisy, raskaudet ja lasten hankinta. [Birth control, pregnancies and childbearing intentions.]. In S. Koskinen, A. Lundqvist, & N. Ristiluoma (Eds.), *Terveys, toimintakyky ja hyvinvointi Suomessa 2011 [Health, functional status and wellbeing in Finland 2011]*. Helsinki: National Instute for Health and Welfare (THL).

Kost, K., Singh, S., Vaughan, B., Trussell, J., & Bankole, A. (2008). Estimates of contraceptive failure from the 2002 National Survey of Family Growth. *Contraception*, *77*(1), 10–21. doi:10.1016/j.contraception.2007.09.013

Kosunen, E. (2000). Family Planning Services. In I. Lottes & O. Kontula (Eds.), *New Views on Sexual Health - The Case of Finland* (pp. 70–84). Helsinki: Väestöliitto. https://vaestoliitto-fi.directo.fi/tieto_ja_tutkimus/vaestontutkimuslaitos/julkaisut/kaikki_julkaisut_all_publication/new_views_on_sexual_health-the/

Kosunen, E., Sihvo, S., Nikula, M., & Hemminki, E. (2004). Raskauden ehkäisy [Birth control]. In P. Koponen & R. Luoto (Eds.), *Lisääntymisterveys Suomessa. Terveys 2000 -tutkimus [Reproductive health in Finland. The Health 2000 survey]* (pp. 54–61). Helsinki: National Public Health Institute.

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

Kuh, D., Ben-Shlomo, Y., Lynch, J., Hallqvist, J., & Power, C. (2003). Life course epidemiology. *Journal of Epidemiology and Community Health*, *57*(10), 778–783. doi:10.1136/jech.57.10.778

Lainiala, L. (2014). *Perhepolitiikka kriisin aikana [Family policy at the time of crisis]*. Helsinki: Family Federation of Finland (Vaestoliitto). http://vaestoliitto-fi-bin.directo.fi/@Bin/2c0e377dc310f936b7de20dc745b0ee4/1422531423/application/pdf/3720143/Perhebarometri%202014_web.pdf

Lappegård, T., & 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., & 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

Lawlor, D. A., & Shaw, M. (2002). Too much too young? Teenage pregnancy is not a public health problem. *International Journal of Epidemiology*, *31*(3), 552–553. doi:10.1093/ije/31.3.552

Leckie, G., & Charlton, C. (2013). runmlwin - A program to run the MLwiN multilevel modelling software from within Stata. *Journal of Statistical Software*, *52*(11), 1–40.

Lee, D. (2010). The early socioeconomic effects of teenage childbearing: A propensity score matching approach. *Demographic Research*, *23*, 697–736. doi:10.4054/DemRes.2010.23.25

Leone, T., & 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

Leppälahti, S., Gissler, M., Mentula, M., & Heikinheimo, O. (2012). Trends in teenage termination of pregnancy and its risk factors: a population-based study in Finland, 1987–2009. *Human Reproduction*, *27*(9), 2829–2836. doi:10.1093/humrep/des253

Levels, M., Need, A., Nieuwenhuis, R., Sluiter, R., & Ultee, W. (2010). Unintended Pregnancy and Induced Abortion in the Netherlands 1954-2002. *European Sociological Review*, *28*(3), 301–318. doi:10.1093/esr/jcq065

Levels, M., Sluiter, R., & Need, A. (2014). A review of abortion laws in Western-European countries. A cross-national comparison of legal developments between 1960 and 2010. *Health Policy*, *118*(1), 95–104. doi:10.1016/j.healthpol.2014.06.008

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., Brien, M. J., & Waite, L. J. (1995). Premarital Cohabitation and Subsequent Marital Dissolution: A Matter of Self-Selection?". *Demography*, *32*(3), 437–457. doi:10.2307/2061690

Lillard, L. A., & 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., & 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

Mackenbach, J. P., Bos, V., Andersen, O., Cardano, M., Costa, G., Harding, S., et al. (2003). Widening socioeconomic inequalities in mortality in six Western European countries. *International Journal of Epidemiology*, *32*(5), 830–837. doi:10.1093/ije/dyg209

Madden, T., Secura, G. M., Allsworth, J. E., & Peipert, J. F. (2011). Comparison of contraceptive method chosen by women with and without a recent history of induced abortion. *Contraception*, *84*(6), 571–577. doi:10.1016/j.contraception.2011.03.018

Makenzius, M., Tydén, T., Darj, E., & Larsson, M. (2011). Repeat induced abortion - a matter of individual behaviour or societal factors? A cross-sectional study among Swedish women. *The European Journal of Contraception & Reproductive Health Care: The Official Journal of the European Society of Contraception*, *16*(5), 369–377. doi:10.3109/13625187.2011.595520

Makkonen, K., & Hemminki, E. (1991). Different Contraceptive Practices - Use of Contraceptives in Finland and Other Nordic Countries in the 1970s and 1980s. *Scandinavian journal of social medicine*, *19*(1), 32.

Mauldon, J., Foster, D. G., & 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

Mentula, M. J., Niinimäki, M., Suhonen, S., Hemminki, E., Gissler, M., & Heikinheimo, O. (2010). Young age and termination of pregnancy during the second trimester are risk factors for repeat second-trimester abortion. *American Journal of Obstetrics and Gynecology*, *203*(2), 107.e1-107.e7. doi:10.1016/j.ajog.2010.03.004

Mollborn, S. (2010). Exploring Variation in Teenage Mothers' and Fathers' Educational Attainment. *Perspectives on Sexual and Reproductive Health*, *42*(3), 152–159. doi:10.1363/4215210

Mood, C., Jonsson, J. O., & Bihagen, E. (2012). Socioeconomic persistence across generations: Cognitive and noncognitive processes. In J. Ermisch, M. Jäntti, & T. M. Smeeding (Eds.), *From Parents to Children: The Intergenerational Transmission of Advantage* (pp. 393–421). New York: Russell Sage Foundation.

Moreau, C., Hall, K., Trussell, J., & Barber, J. (2013). Effect of prospectively measured pregnancy intentions on the consistency of contraceptive use among young women in Michigan. *Human Reproduction*, *28*(3), 642–650. doi:10.1093/humrep/des421

Morgan, P. S., & Bachrach, C. (2011). Is the Theory of Planned Behaviour an appropriate model for human fertility? *Vienna Yearbook of Population Research*, *9*, 11–18. doi:10.1553/populationyearbook2011s11

Morgan, P. S., & Hagewen, K. J. (2005). Fertility. In D. L. Poston & M. Micklin (Eds.), *Handbook of Population* (pp. 229–249). New York; London: Kluwer Academic/Plenum.

Murphy, M., & Knudsen, L. B. (2002). The intergenerational transmission of fertility in contemporary Denmark: The effects of number of siblings (full and half), birth order, and whether male or female. *Population Studies*, *56*(3), 235–248. doi:10.1080/00324720215937

Niinimäki, M., Pouta, A., Bloigu, A., Gissler, M., Hemminki, E., Suhonen, S., & Heikinheimo, O. (2009). Frequency and risk factors for repeat abortions after surgical compared with medical termination of pregnancy. *Obstetrics and gynecology*, *113*(4), 845–852. doi:10.1097/AOG.0b013e31819cae06

Nisén, J., Martikainen, P., Kaprio, J., & 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

Notkola, I.-L. (1993). Suomalaisten suhtautuminen aborttiin [The Attitudes of Finns towards Abortion]. In M. Rimpelä & M. Ritamo (Eds.), *Raskauden keskeyttäminen - suomalaisia valintoja 1990-luvulla [Termination of Pregnancy - Finnish Choices in the 1990s]* (pp. 87–102). Helsinki: Stakes.

Nutbeam, D. (2000). Health literacy as a public health goal: a challenge for contemporary health education and communication strategies into the 21st century. *Health Promotion International*, *15*(3), 259–267. doi:10.1093/heapro/15.3.259

OECD. (2010). How many young people graduate from tertiary education? In *Highlights from Education at a Glance* (pp. 18–19). Paris: Organisation for Economic Co-operation and Development. http://www.oecd-ilibrary.org/content/chapter/eag_highlights-2010-6-en

Official Statistics of Finland. (2012). *Births [e-publication]*. Helsinki: Statistics Finland. http://www.stat.fi/til/synt/2012/synt_2012_2013-04-12_tie_001_en.html. Accessed 8 June 2015

Official Statistics of Finland. (2013a). Concepts and definitions - Main type of activity. http://www.stat.fi/meta/kas/tyovoima_ulkopu_en.html. Accessed 2 December 2013

Official Statistics of Finland. (2013b). *Population structure [e-publication]*. Helsinki: Statistics Finland. http://stat.fi/til/vaerak/tau_en.html. Accessed 18 December 2013

Official Statistics of Finland. (2013c). Income and Consumption. http://www.stat.fi/tup/suoluk/suoluk_tulot_en.html#recipients. Accessed 29 June 2015

Official Statistics of Finland. (2013). Classification of Socio-economic Groups 1989. http://www.stat.fi/meta/luokitukset/sosioekon_asema/001-1989/kuvaus_en.html. Accessed 2 December 2013

Official Statistics of Finland. (2013d, March 22). Työssäkäynti [verkkojulkaisu]. [Labour force participation (e-publication)]. http://www.stat.fi/til/tyokay/2011/02/tyokay_2011_02_2013-03-22_laa_001_fi.html. Accessed 10 October 2015

Official Statistics of Finland. (2015a). Taxable incomes [E-publication]. http://www.stat.fi/til/tvt/kas_en.html. Accessed 30 October 2015

Official Statistics of Finland. (2015b). Concepts and definitions - Cohabiting couple. *Cohabiting couple*. http://www.stat.fi/meta/kas/avopari_en.html. Accessed 3 September 2015

Official Statistics of Finland. (2015). Educational structure of population 2014. http://stat.fi/til/vkour/2014/vkour_2014_2015-11-05_tie_001_en.html. Accessed 14 December 2015

Official Statistics of Finland. (2015). *Employment [e-publication]*. Helsinki: Statistics Finland. http://www.stat.fi/til/tyokay/tau_en.html. Accessed 7 January 2016

Official Statistics of Finland, O. (2009). Statistical Grouping of Municipalities 2009. http://www.stat.fi/meta/luokitukset/kuntaryhmitys/001-2009/index_en.html. Accessed 30 October 2015

Olausson, P. O., Haglund, B., Weitoft, G. R., & Cnattingius, S. (2001). Teenage Childbearing and Long-Term Socioeconomic Consequences: A Case Study in Sweden. *Family Planning Perspectives*, *33*(2), 70–74. doi:10.2307/2673752

Olsson, C. A., Horwill, E., Moore, E., Eisenberg, M. E., Venn, A., O'Loughlin, C., & Patton, G. C. (2014). Social and emotional adjustment following early pregnancy in young Australian women: A comparison of those who terminate, miscarry, or complete pregnancy. *Journal of Adolescent Health*, *54*(6), 698–703. doi:10.1016/j.jadohealth.2013.10.203

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

Osler, M., David, H. P., & Morgall, J. M. (1997). Multiple induced abortions: Danish experience. *Patient Education and Counseling*, *31*(1), 83–89. doi:10.1016/S0738-3991(97)01012-4

Paranjothy, S., Broughton, H., Adappa, R., & Fone, D. (2009). Teenage pregnancy: who suffers? *Archives of disease in childhood*, *94*(3), 239–245. doi:10.1136/adc.2007.115915

Pereira, C. A. de B., Stern, J. M., & Wechsler, S. (2008). Can a significance test be genuinely Bayesian? *Bayesian Analysis*, *3*(1), 79–100. doi:10.1214/08-BA303

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*, *30*(4), 437–464. doi:10.1007/s10680-014-9320-2

Perelli-Harris, B., Mynarska, M., Berrington, A., Berghammer, C., Evans, A., Isupova, O., et al. (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

Pohjoranta, E., Mentula, M., Gissler, M., Suhonen, S., & Heikinheimo, O. (2015). Provision of intrauterine contraception in association with first trimester induced abortion reduces the need of repeat abortion: first-year results of a randomized controlled trial. *Human Reproduction (Oxford, England)*, *30*(11), 2539–2546. doi:10.1093/humrep/dev233

Population Register Centre. (2015). Population Information System - Population Register Centre. http://www.vrk.fi/default.aspx?id=39. Accessed 26 September 2015

Pouta, A., Järvelin, M.-R., Hemminki, E., Sovio, U., & Hartikainen, A.-L. (2005). Mothers and daughters: intergenerational patterns of reproduction. *European journal of public health*, *15*(2), 195–199. doi:10.1093/eurpub/cki078

Ranjit, N., Bankole, A., Darroch, J. E., & Singh, S. (2001). Contraceptive Failure in the First Two Years of Use: Differences across Socioeconomic Subgroups. *Family Planning Perspectives*, *33*(1), 19–27. doi:10.2307/2673738

Rantakallio, P., & Myhrman, A. (1990). Changes in fertility and the acceptability of pregnancies in northern Finland during the last 20 years. *International Journal of Epidemiology*, *19*(1), 109–114.

Rasbash, J., Charlton, C., Browne, W. J., Healy, M., & Cameron, B. (2009). *MLwiN Version 2.1*. Centre for Multilevel Modelling, University of Bristol. http://www.bristol.ac.uk/cmm/software/mlwin/

Rasch, V., Gammeltoft, T., Knudsen, L. B., Tobiassen, C., Ginzel, A., & Kempf, L. (2007). Induced abortion in Denmark: effect of socio-economic situation and country of birth. *The European Journal of Public Health*, *18*(2), 144–149. doi:10.1093/eurpub/ckm112

Regushevskaya, E., Dubikaytis, T., Laanpere, M., Nikula, M., Kuznetsova, O., Haavio-Mannila, E., et al. (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

Richiardi, L., Bellocco, R., & Zugna, D. (2013). Mediation analysis in epidemiology: methods, interpretation and bias. *International Journal of Epidemiology*, *42*(5), 1511–1519. doi:10.1093/ije/dyt127

Ritamies, M. (1993). Have the Aims of the Finnish Abortion Law Been Reached? *Yearbook of Population Research in Finland*, *31*, 62–71.

Roberts, H., Silva, M., & Xu, S. (2010). Post abortion contraception and its effect on repeat abortions in Auckland, New Zealand. *Contraception*, *82*(3), 260–265. doi:10.1016/j.contraception.2010.03.003

Rodriguez, G., & Goldman, N. (1995). An Assessment of Estimation Procedures for Multilevel Models with Binary Responses. *Journal of the Royal Statistical Society. Series A (Statistics in Society)*, *158*(1), 73–89. doi:10.2307/2983404

Rose, S. B., & Lawton, B. A. (2012). Impact of long-acting reversible contraception on return for repeat abortion. *American Journal of Obstetrics and Gynecology*, *206*(1), 37.e1-37.e6. doi:10.1016/j.ajog.2011.06.102

Rose, S. B., Stanley, J., & Lawton, B. A. (2015). Time to second abortion or continued pregnancy following a first abortion: a retrospective cohort study. *Human Reproduction*, *30*(1), 214–221. doi:10.1093/humrep/deu283

Salmi, M., Lammi-Taskula, J., & Närvi, J. (2009). *Perhevapaat ja työelämän tasa-arvo. [Parental leave and the gender equality of the labour market.]*. Helsinki: Työ- ja elinkeinoministeriö.

Santelli, J. S., Lindberg, L. D., Orr, M. G., Finer, L. B., & Speizer, I. (2009). Toward a multidimensional measure of pregnancy intentions: evidence from the United States. *Studies in Family Planning*, *40*(2), 87–100.

Santelli, J. S., Rochat, R., Hatfield-Timajchy, K., Gilbert, B. C., Curtis, K., Cabral, R., et al. (2003). The measurement and meaning of unintended pregnancy. *Perspectives on Sexual and Reproductive Health*, *35*(2), 94–101.

Saurina, C., Vall-llosera, L., & Saez, M. (2012). Factors determining family planning in Catalonia. Sources of inequity. *International Journal for Equity in Health*, *11*, 35. doi:10.1186/1475-9276-11-35

Sedgh, G., Bankole, A., Singh, S., & Eilers, M. (2013). Legal Abortion Levels and Trends By Woman's Age at Termination. *Perspectives on Sexual and Reproductive Health*, *45*(1), 13–22. doi:10.1363/4501313

Sedgh, G., Bearak, J., Singh, S., Bankole, A., Popinchalk, A., Ganatra, B., et al. (2016). Abortion incidence between 1990 and 2014: global, regional, and subregional levels and trends. *The Lancet*. doi:10.1016/S0140-6736(16)30380-4

Sedgh, G., Finer, L. B., Bankole, A., Eilers, M. A., & Singh, S. (2015). Adolescent Pregnancy, Birth, and Abortion Rates Across Countries: Levels and Recent Trends. *Journal of Adolescent Health*, *56*(2), 223–230.

Sedgh, G., Henshaw, S. K., Singh, S., Bankole, A., & Drescher, J. (2007). Legal abortion worldwide: incidence and recent trends. *Perspectives on Sexual and Reproductive Health*, *39*(4), 216–225. doi:10.1363/3921607

Sedgh, G., Singh, S., Shah, I. H., Åhman, E., Henshaw, S. K., & Bankole, A. (2012). Induced abortion: incidence and trends worldwide from 1995 to 2008. *The Lancet*, *379*(9816), 625–632. doi:10.1016/S0140-6736(11)61786-8

Shkolnikov, V. M., Andreev, E. M., Jdanov, D. A., Jasilionis, D., Kravdal, Ø., Vågerö, D., & Valkonen, T. (2012). Increasing absolute mortality disparities by education in Finland, Norway and Sweden, 1971-2000. *Journal of Epidemiology and Community Health*, *66*(4), 372–378. doi:10.1136/jech.2009.104786

Shtarkshall, R. A., Santelli, J. S., & Hirsch, J. S. (2007). Sex Education and Sexual Socialization: Roles for Educators and Parents. *Perspectives on Sexual and Reproductive Health*, *39*(2), 116–119. doi:10.1363/3911607

Sihvo, S., Hemminki, E., Kosunen, E., & Koponen, P. (1998). Quality of care in abortion services in Finland. *Acta Obstetricia et Gynecologica Scandinavica*, *77*(2), 210–217. doi:10.1034/j.1600-0412.1998.770216.x

Singh, S., Sedgh, G., & Hussain, R. (2010). Unintended Pregnancy: Worldwide Levels, Trends, and Outcomes. *Studies in Family Planning*, *41*(4), 241–250. doi:10.1111/j.1728-4465.2010.00250.x

Singh-Manoux, A., Ferrie, J. E., Chandola, T., & Marmot, M. (2004). Socioeconomic trajectories across the life course and health outcomes in midlife: evidence for the accumulation hypothesis? *International Journal of Epidemiology*, *33*(5), 1072–1079. doi:10.1093/ije/dyh224

Sirniö, O., Martikainen, P., & Kauppinen, T. M. (2013). Intergenerational Determinants of Income Level in Finland. *Social Forces*, *92*(2), 463–490. doi:10.1093/sf/sot098

Smith, D. M., & Roberts, R. (2011). Social inequality and young pregnancy: the causal attributions of young parents in London, UK. *Health & place*, *17*(5), 1054–1060. doi:10.1016/j.healthplace.2011.06.009

Sobotka, T., Skirbekk, V., & Philipov, D. (2011). Economic Recession and Fertility in the Developed World. *Population and Development Review*, *37*(2), 267–306. doi:10.1111/j.1728-4457.2011.00411.x

Spiegelhalter, D. J., Best, N. G., Carlin, B. P., & Van Der Linde, A. (2002). Bayesian measures of model complexity and fit. *Journal of the Royal Statistical Society: Series B (Statistical Methodology), 64*(4), 583–639. doi:10.1111/1467-9868.00353

Statistics Finland. (2011). Educational structure of population. http://www.stat.fi/meta/til/vkour_en.html. Accessed 26 September 2015

Statistics Finland. (2013). Data protection. http://www.stat.fi/meta/tietosuoja/index_en.html. Accessed 19 March 2013

Statistics Finland. (2015). Concepts and definitions - Income subject to state taxation. http://www.stat.fi/meta/kas/valt_veronal_tu_en.html. Accessed 27 September 2015

Steele, F. (2005). Event History Analysis. *A National Centre for Research Methods Briefing Paper, NCRM/004*, 1–37.

Steele, F., Goldstein, H., & 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., & Joshi, H. (2005). The Relationship between Childbearing and Transitions from Marriage and Cohabitation in Britain. *Demography*, *42*(4), 647–673. doi:10.2307/4147333

Steele, F., Kallis, C., & Joshi, H. (2006). The formation and outcomes of cohabiting and marital partnerships in early adulthood: the role of previous partnership experience. *Journal of the Royal Statistical Society: Series A (Statistics in Society)*, *169*(4), 757–779. doi:10.1111/j.1467-985X.2006.00420.x

Stone, N., & Ingham, R. (2011). Who presents more than once? Repeat abortion among women in Britain. *Journal of Family Planning and Reproductive Health Care*, *37*(4), 209–215. doi:10.1136/jfprhc-2011-0063

Sundby, J., Svanemyr, J., & Mæhre, T. (1999). Avoiding unwanted pregnancy — the role of communication, information and knowledge in the use of contraception among young Norwegian women. *Patient Education and Counseling*, *38*(1), 11–19. doi:10.1016/S0738-3991(98)00113-X

Sutela, H. (2013). *Määräaikainen Työ Ja Perheellistyminen Suomessa 1984–2008 [Temporary Contracts and Family Formation in Finland 1984-2008]* (No. 259). Helsinki: Statistics Finland. http://www.stat.fi/tup/julkaisut/tiedostot/julkaisuluettelo/ytut_259_201300_2013_10310_net.pdf

Sydsjö, A., Josefsson, A., & Sydsjö, G. (2009). Trends in induced abortions between 1975 and 2000 in a cohort of women born in 1960-64 in four Scandinavian countries. *The European Journal of Contraception & Reproductive Health Care: The Official Journal of the European Society of Contraception*, *14*(5), 334–339. doi:10.3109/13625180903039160

Taylor, J. L. (2009). Midlife Impacts of Adolescent Parenthood. *Journal of family issues*, *30*(4), 484–510. doi:10.1177/0192513X08329601

Testa, M. R., & Basten, S. (2014). Certainty of meeting fertility intentions declines in Europe during the "Great Recession." *Demographic Research*, *31*, 687–734. doi:10.4054/DemRes.2014.31.23

The American College of Obstetricians and Gynecologists Committee on Gynecologic Practice, & The Practice Committee of the American Society for Reproductive Medicine. (2014). Female age-related fertility decline. *Fertility and Sterility*, *101*(3), 633–634. doi:10.1016/j.fertnstert.2013.12.032

THL. (2015a). Register of induced abortions - THL. *National Institute for Health and Welfare*. http://www.thl.fi/en/web/thlfi-en/statistics/information-on-statistics/register-descriptions/register-of-induced-abortions. Accessed 26 September 2015

THL. (2015b). Medical Birth Register - THL. *National Institute for Health and Welfare*. http://www.thl.fi/en/web/thlfi-en/statistics/information-on-statistics/register-descriptions/newborns. Accessed 26 September 2015

Triventi, M. (2013). The role of higher education stratification in the reproduction of social inequality in the labor market. *Research in Social Stratification and Mobility*, *32*(1), 45–63. doi:10.1016/j.rssm.2013.01.003

Trussell, J. (2007). The cost of unintended pregnancy in the United States. *Contraception*, *75*(3), 168–170. doi:10.1016/j.contraception.2006.11.009

Trussell, J., Vaughan, B., & Stanford, J. (1999). Are All Contraceptive Failures Unintended Pregnancies? Evidence from the 1995 National Survey of Family Growth. *Family Planning Perspectives*, *31*(5), 246–260. doi:10.2307/2991573

University Pharmacy. (2014). Online Pharmacy [Verkkoapteekki - Yliopiston Apteekki]. http://www.yliopistonapteekki.fi/fi/apteekkipalvelut/Pages/Default.aspx. Accessed 29 January 2014

Upchurch, D. M., Lillard, L. A., & Panis, C. W. A. (2002). Nonmarital Childbearing: Influences of Education, Marriage, and Fertility. *Demography*, *39*(2), 311–329. doi:10.2307/3088341

Väestöliitto - Family Federation of Finland. (2012, May 8). IUD [Kierukka]. http://www.vaestoliitto.fi/seksuaalisuus/tietoa-seksuaalisuudesta/aikuiset/seksuaalisuuden_suloja_ja_seksin/raskauden_ehkaisy/kierukka/. Accessed 29 January 2014

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*, *FirstView*, 1–13. doi:10.1017/S002193201600016X

Väisänen, H., & Jokela, M. (2010). Fertility after Induced Abortion: a Register-Based Study in Finland 2000-2008. *Finnish Yearbook of Population Research*, *XLV*, 25–44.

Väisänen, H., & 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., & Rimpela, 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

Vuori, A., & Gissler, M. (2013). *Perinatal statistics: parturients, deliveries and newborns 2012* (Official Statistics of Finland). Helsinki: National Institute for Health and Welfare. http://urn.fi/URN:NBN:fi-fe201309276347. Accessed 20 May 2014

Wellings, K., Jones, K. G., Mercer, C. H., Tanton, C., Clifton, S., Datta, J., et al. (2013). The prevalence of unplanned pregnancy and associated factors in Britain: findings from the third National Survey of Sexual Attitudes and Lifestyles (Natsal-3). *The Lancet*, *382*(9907), 1807–1816. doi:10.1016/S0140-6736(13)62071-1

White, L., & 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

WHO, & Maternal Health and Safe Motherhood Programme. (1993). *The Prevention and management of unsafe abortion: report of a technical working group, Geneva, 12-15 April 1992*. Geneva: World Health Organization. http://www.who.int/iris/handle/10665/59705. Accessed 18 February 2016

Wildsmith, E., Guzzo, K. B., & Hayford, S. R. (2010). Repeat unintended, unwanted and seriously mistimed childbearing in the United States. *Perspectives on sexual and reproductive health*, *42*(1), 14–22. doi:10.1363/4201410

Wilkinson, R. G., & Pickett, K. (2010). *The spirit level: why equality is better for everyone*. London; New York: Penguin Books.

Williams, R. (2012). Using the margins command to estimate and interpret adjusted predictions and marginal effects. *The Stata Journal*, *12*(2), 308–331.

Winner, B., Peipert, J. F., Zhao, Q., Buckel, C., Madden, T., Allsworth, J. E., & Secura, G. M. (2012). Effectiveness of Long-Acting Reversible Contraception. *New England Journal of Medicine*, *366*(21), 1998–2007. doi:10.1056/NEJMoa1110855

World Values Survey Association. (2009). WORLD VALUES SURVEY 1981-2008 OFFICIAL AGGREGATE v.20090901. ASEP/JDS, Madrid. www.worldvaluessurvey.org

YLE News. (2015, December 31). PM Sipilä: Prepare for additional cuts in 2017, if competitiveness doesn't improve. *The Finnish Boradcasting Company (YLE) News*. Finland. http://yle.fi/uutiset/pm_sipila_prepare_for_additional_cuts_in_2017_if_competitiveness_doesnt_improve/8565028. Accessed 20 January 2016