Risk of Postpartum Induced Abortion in Finland: A Register-Based Study

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CONTEXT: Half of Finnish abortion patients already have children, and one in 10 pregnancies ending in abortions started within 12 months of a birth. Thus, many women may not practice contraception effectively during the postpartum period.

METHODS: Data from national registers were used to create a joint data file on pregnancies occurring in Finland over the period 1987–1998. The abortion risk (the risk of a conception that leads to an induced abortion) and abortion ratio (the number of conceptions leading to abortions divided by the number leading to deliveries) were analyzed in follow-up periods after all live births to women younger than 45 (684,922), using hazard regression and logistic regression.

RESULTS: Pregnancies starting within eight months postpartum were more likely to end in abortion than were those starting later. Within the first eight months, the shorter the interval to the next pregnancy, the more likely the pregnancy was to end in abortion. Abortion risk was higher 6–18 months postpartum than at later periods and was highest at 6–8 months postpartum, particularly among unmarried women and teenagers. Between 1987–1988 and 1995–1996, the abortion risk within the first eight months postpartum rose significantly among women aged 25–29 and 30–34 (relative risks, 1.5 and 1.2, respectively). The abortion risk and abortion ratio were higher among teenagers than among women in other age-groups.

CONCLUSIONS: The findings are consistent with the hypothesis that contraceptive practice is less effective postpartum, suggesting room for improvement in postpartum contraceptive counseling in Finland.

Finland's abortion rate declined continuously from the early 1970s to the mid-1990s and increased slightly thereafter. This generally positive development concealed an important point, however: Among 25−29-year-old and 30−34-year-old women, the decreasing trend had already stopped in the late 1980s; in fact, when the generally downward abortion trend reversed slightly in the mid-1990s, abortion rates in these two age-groups had been increasing slowly for several years.[1] It is noteworthy that in Finland, 65% of all births in 1997−1998 occurred among 25−34-year-olds.

Finnish abortion statistics indicate that half of all women who undergo an abortion already have one or more children.[2] In addition, our preliminary calculations showed that in 9% of all abortions (that is, around 900−950 each year), the pregnancy started within 12 months of the last birth. This raises a question about the effectiveness of contraceptive use during the postpartum period.

In Finland, family planning and maternity services, as well as child welfare services, are free of charge and are provided through primary health care centers, by public health nurses and general practitioners. Today, 95% of pregnant women contact the maternity care unit before their 16th week of pregnancy.[3] During a normal pregnancy, they have 12 appointments with a nurse and three with a physician, often together with their partner.[4] In addition, women receive two postpartum appointments: The first is a home visit about one week after delivery, and the second is a postpartum health check (usually carried out around six weeks after delivery) that is obligatory before women can receive some social benefits.

Contraceptive counseling is supposed to be discussed at the second postpartum visit.[5] In addition, parents are invited to bring their child to a child welfare clinic nine times over the first eight months after delivery, three of these visits being consultations with a general practitioner. Again, these visits provide an opportunity to discuss contraception. In theory, providing services before and after delivery should be sufficient to ensure that all couples receive contraceptive counseling that is tailored to their needs.

However, during the postpartum months, lactation, recovery of fecundity and contraception may prove problematic. A woman is protected against conception for six months if she is amenorrheic and is breastfeeding exclusively or almost exclusively.[6] In Finland, breastfeeding is recommended strongly to all mothers during maternal counseling, but complementary feeding often starts at 3−4 months, and only 10% of four-month-old babies are exclusively or almost exclusively breastfed.[7] Thus, lactational amenorrhea alone is no longer sufficiently effective at that point, and another contraceptive method is needed.

Research data and clinical experience both suggest that in Finland, the condom is the most popular postpartum

method as long as lactation continues, and even long after the woman has stopped breastfeeding.[8] Probably because of inconsistent recommendations, the IUD commonly is not inserted before a woman has started menstruating again,[9] and combined oral contraceptives are not recommended at all for women who are breastfeeding, because they reduce breast milk production.[10] As a result, hormonal methods (the combined pill and progestin-based methods) are very seldom used before breastfeeding is over, and in most cases are not used until at least 6–8 months after delivery.[11] Thus, given current family planning practices, it appears that between 3–4 months and 6–8 months postpartum, effective contraceptive methods are underused.

The literature on postpartum contraception and the risk of unintended postpartum pregnancy consists of studies relying on relatively small samples.[12] Most of this research deals with the appropriate choice and timing of contraceptive use in general and with the reliability of the lactational amenorrhea method in particular.[13] However, to our knowledge, no population-based studies have included a detailed measurement of postpartum pregnancy or abortion risk and compared this with the corresponding risk in other periods of life.

We hypothesize that because of the problems related to postpartum contraception, a higher number of unintended pregnancies occur during the early months postpartum than later after delivery, and that this leads to a higher abortion rate. The main objective of this article is to determine whether the abortion rate is higher in certain months or in longer periods postpartum and how this difference is related to the timing of a pregnancy relative to the preceding live birth. We also aim to determine whether postpartum abortion rates in Finland have changed over the past 12 years, and to analyze variations in postpartum abortion rates and abortion ratios by women's age, marital status and parity.

DATA AND METHODS

In Finland, a well-established system of registers related to reproduction (the Abortion and Sterilization Register, the Medical Birth Register and the Hospital Care Register), all located at the National Research and Development Centre for Welfare and Health (STAKES),[14] has been in operation for more than 10 years. These registers make it possible to study temporal changes in behavior. An evaluation study found that the Finnish Abortion Register includes 99% of abortions performed in the country.[15] The Birth Register covers virtually all births in Finland, and is checked for consistency with the Population Register.[16] Information on miscarriages, which we retrieved from the Hospital Care Register, includes only cases that involved inpatient treatment. (Seventy-four percent of Finnish women who have a miscarriage are treated as inpatients.[17])

The use of personal identification numbers throughout these registers enables us to link records from different data sources. The analyses in this article benefit from this possibility by using a register data set that covers the total pop-

ulation of the country over a 12-year period, by following up individual event-histories over that period and by combining the different event-histories across registers. Using the registers on reproduction maintained by STAKES, we created a joint data file covering individual-level pregnancy histories in Finland over the period from 1987 to 1998. The linkage procedure and research plan were approved by a research ethics committee.

In our analyses, we used data on all live births to women younger than 45 in the period from 1987 to 1997 (which totaled 684,922) and followed the women to their next con-

TABLE 1. Number of postpartum abortions and births, by time elapsed from index birth to following conception

Months elapsed	Induced abortions	Births
<6	2,777	12,430
6–8	2,422	20,481
9–12	2,786	36,049
13–18	3,597	49,881
19–24	2,733	36,806

Note: Based on conceptions within two years of the 567,128 index births that occurred in the period 1987–1995.

TABLE 2. Relative risks of induced abortion (and 95% confidence intervals), as estimated from a hazard regression model, and odds ratios showing relative abortion ratios (and 95% confidence intervals), as estimated from a logistic regression model, all by selected characteristics

Characteristic	Relative abortion risk	Relative abortion ratio
Time since birth (mos.)		
3–5	0.97 (0.92–1.03)	2.08 (1.96–2.21)*
6–8	1.14 (1.08–1.20)*	1.41 (1.33–1.49)*
9–12	1.08 (1.02–1.13)*	0.99 (0.94–1.05)
13–18	1.10 (1.05–1.15)*	0.99 (0.94–1.04)
19–24 (ref)	1.00	1.00
25–30	1.05 (1.00–1.11)	1.13 (1.06–1.19)*
31–36	0.97 (0.91–1.03)	1.25 (1.17–1.33)*
37–42	0.97 (0.91–1.03)	1.38 (1.29–1.48)*
43–48	0.99 (0.93–1.06)	1.58 (1.47–1.70)*
49–54	1.00 (0.94–1.08)	1.79 (1.66–1.94)*
55–60	0.94 (0.87–1.02)	1.86 (1.71–2.03)*
Current age		
14–19	1.95 (1.82–2.08)*	2.11 (1.95–2.28)*
20–24 (ref)	1.00	1.00
25–29	0.49 (0.47–0.50)*	0.56 (0.54–0.59)*
30–34	0.32 (0.31–0.33)*	0.51 (0.49–0.53)*
35–39	0.25 (0.24–0.26)*	0.62 (0.59–0.66)*
40–44	0.21 (0.19–0.23)*	1.21 (1.11–1.33)*
Marital status at birth		
Married (ref)	1.00	1.00
Cohabiting	2.16 (2.10–2.23)*	2.55 (2.47–2.63)*
Never-married	2.99 (2.87–3.11)*	4.68 (4.48–4.89)*
Widowed	2.27 (1.58–3.25)*	2.23 (1.45–3.42)*
Divorced	3.76 (3.47–4.07)*	3.75 (3.41–4.14)*
Parity		
1 (ref)	1.00	1.00
2	1.49 (1.45–1.54)*	3.49 (3.38–3.61)*
3	2.17 (2.08–2.26)*	5.64 (5.41–5.89)*
≥4	2.32 (2.20–2.45)*	2.80 (2.63–2.97)*
Intercept	*.001391*	*.03982*

*p<.05. *Notes:* For each measure, results of a likelihood ratio test indicated that each variable was significant at p<.001. ref=reference group.

FIGURE 1. Monthly number of postpartum conceptions per 1,000 person-years, by time elapsed since index birth
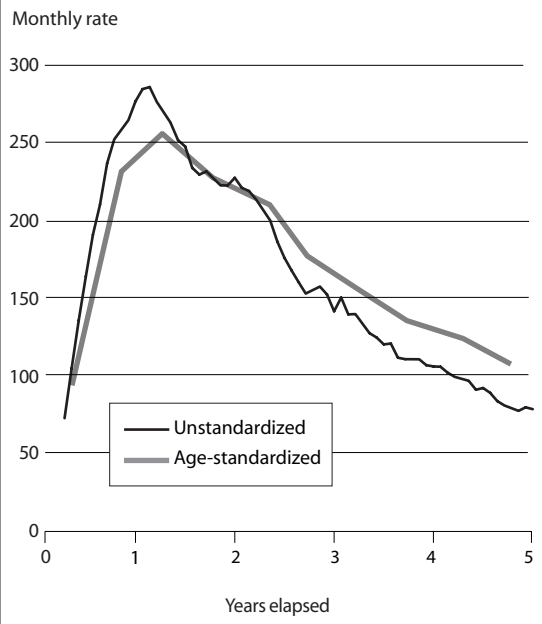
Monthly rate

Notes: Conceptions include pregnancies that ended in live birth, induced abortion or miscarriage. Age-standardized relative risks were estimated from a hazard regression model including time elapsed since index birth and age. They were converted to the absolute risk per 1,000 person-years using as the reference point the unstandardized rate at 19–24 months from the index birth.

ception. The follow-up time after a live birth is the unit of observation, and several births to the same woman are treated as independent units of observation (although a multiple birth initiates one follow-up period). The follow-up period starts with a live birth (we refer to this as the index birth) and ends with the occurrence of a conception leading to an induced abortion (28,119 events) or a delivery* (266,117), or is censored at one of the following events: a conception leading to a miscarriage (29,408), sterilization (47,908), the woman's 45th birthday (18,908) or the end of the observation period in February 1998† (294,462). The number of pregnancies that ended in an induced abortion or a birth within two years after the index birth is presented in Table 1 (page 85).

To calculate the month of the next conception, we subtracted the recorded duration of the pregnancy from the recorded month of the abortion or birth. In the case of miscarriages, we assumed that the duration was two months. Records of women with any inconsistency in the linked pregnancy-history record or with missing information on the month of occurrence of any of the events were removed from the data (0.5% of index births).

We also present some information on the distribution of abortion patients by the contraceptive method that they used before conception and the time that had elapsed since

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*Pregnancies that ended in a stillbirth were included among the deliveries. Pregnancies that resulted in a multiple birth counted as one event.

†Although we have data on the entire year 1998, the follow-up is truncated in February because pregnancies that started later may have ended in a birth in 1999, which we could not have observed.

the index birth (which we obtained from the abortion register). These data describe only the distribution of women whose contraceptive method failed (if they used any), and thus they cannot measure the use of all methods postpartum. However, if we assume that each method's failure rate remains constant by the time elapsed since delivery, the change in this distribution should reflect the direction of change in contraceptive use over the time since the index birth.

We used GLIM software to fit hazard (intensity) regression models for estimating the abortion risk of women after a live birth, and to fit logistic regression models for estimating the ratio of pregnancies that end in induced abortion to pregnancies that end in delivery (the abortion ratio).[18] In this article, the word *risk* connotes the hazard rate of an event—either the start of a pregnancy that ends in abortion (abortion risk) or the start of any pregnancy (conception risk). In hazard regression models, the time elapsed since the previous birth is the baseline time variable, and the baseline hazard was defined as piecewise constant. Explanatory variables included marital status, parity (the woman's number of live births) and calendar year, all of which were obtained from the record of the index birth. However, the time elapsed since the index birth and the woman's age were updated in the course of follow-up.

The hazard regression model parameters are presented as relative risks, and the logistic regression model parameters are given as odds ratios; the likelihood ratio test at the 5% level was used to test the significance of a variable. We calculated the age-standardized curves of the concep-

FIGURE 2. Monthly number of postpartum abortions per 1,000 person-years, by time elapsed since index birth
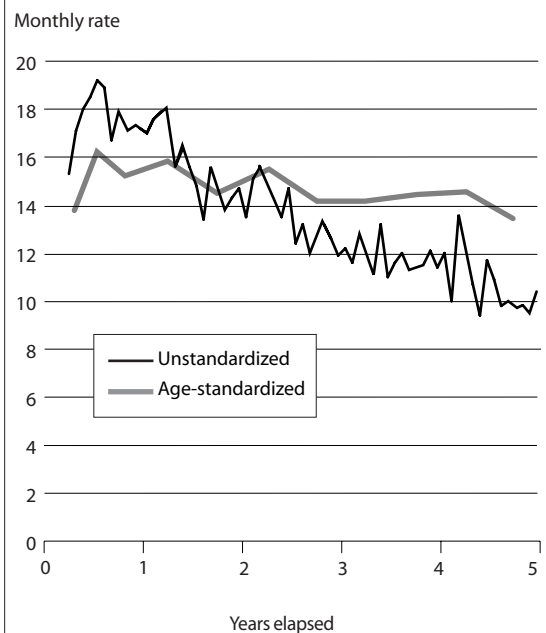
Monthly rate

Notes: Conceptions include pregnancies that ended in live birth, induced abortion or miscarriage. Age-standardized relative risks were estimated from a hazard regression model including time elapsed since index birth and age. They were converted to the absolute risk per 1,000 person-years using as the reference point the unstandardized rate at 19–24 months from the index birth.

tion risk, the abortion risk and the abortion ratio by fitting respective regression models with time elapsed since the index birth and age.[19] We transformed relative risks and odds ratios obtained from the models to absolute risks and ratios, using as the reference the unstandardized rate or ratio in the interval 19–24 months from the index birth.

When investigating the differences in the shape of the postpartum abortion curve, we fitted interactions of time elapsed from the birth with the other variables. For the study of temporal change, we selected a postpartum spell of eight months, on the basis of the curve of the postpartum abortion ratio.

RESULTS

The postpartum conception risk rose quickly during the first year after the index birth and started to decrease thereafter (Figure 1). This curve is heavily influenced by pregnancies that ended in delivery, as these represent the large majority of all pregnancies in Finland.[20]

The curve of the postpartum abortion risk had a somewhat different pattern, increasing from the third month to the seventh month postpartum and decreasing thereafter (Figure 2). The curve of the postpartum abortion risk flattened considerably after we controlled for age. However, its shape did not change further when we also controlled for marital status at birth and parity, even though the level of abortion risk varied across these variables (Table 2, page 85). From six months to 18 months postpartum, and particularly from six to eight months, the abortion risk was higher than after 18 months postpartum; there was very little variation in the abortion risk after 18 months postpartum.

Teenage mothers had a higher abortion risk than those aged 20–24 (relative risk, 2.0), and the relative risk declined significantly with age, from 0.5 at ages 25–29 to 0.2 at ages 40–44. The postpartum abortion risk of unmarried women was higher than that of married women (relative risks, 2.2–3.8). Notably, women cohabiting at the time of childbirth had an abortion risk closer to that of never-married women than to that of married women. Starting from parity one, abortion risk increased with parity: The relative risk rose from 1.5 among those with two births to 2.3 among those with four or more.

The shape of the curve of postpartum abortion risk over time varied according to age, marital status and parity (Figure 3). Unmarried women and higher-parity women had a greater abortion risk in the first 18 months postpartum than at longer durations; the abortion risk among unmarried women appears to peak at 6–8 months postpartum. Among teenagers, the level of risk was highest at 3–8 months postpartum and dropped considerably thereafter. In the other age-groups, the variation in the abortion risk by time elapsed since birth was small. Abortion risks were not elevated among married mothers and first-time mothers in the months after the index birth.
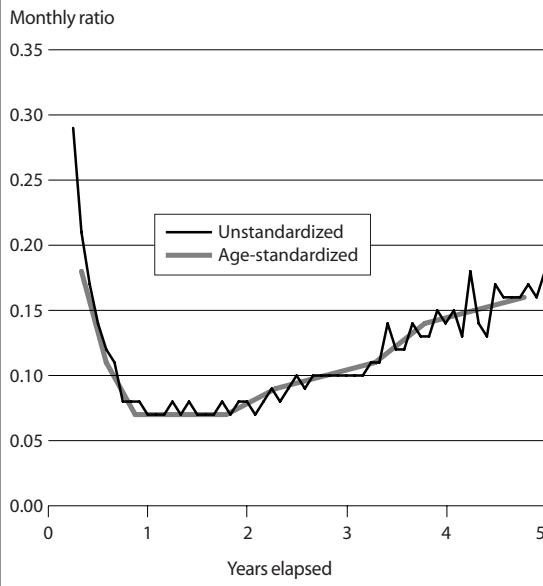
Overall, the abortion ratio (i.e., the ratio of conceptions leading to abortions to conceptions leading to births) was

FIGURE 3. Relative risk of postpartum abortion, by time elapsed since index birth, according to age, marital status at index birth and parity
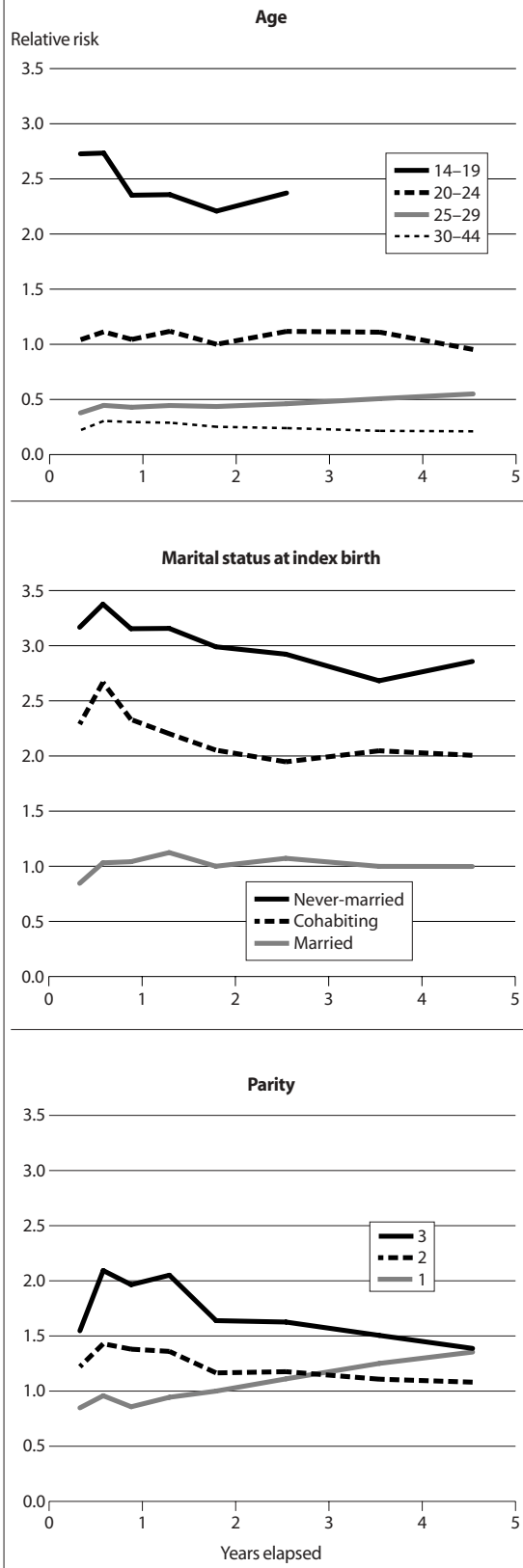
Notes: Relative risks were estimated using hazard regression models that included age, parity and the interaction of the variable being examined with time elapsed since delivery. Reference categories were 20–24-year-olds, married women and women at parity one, all at 19–24 months postpartum.

FIGURE 4. Unstandardized and age-standardized monthly abortion ratios, by time elapsed since index birth

Notes: The abortion ratio represents the ratio of conceptions leading to abortions to conceptions leading to births. The time reference for both abortions and births was the month of conception. Age-standardized relative abortion ratios (odds ratios) were estimated from a logistic regression model including time elapsed since index birth and age. They were converted to absolute ratios using as the reference point the unstandardized ratio at 19–24 months from the index birth.

highest in the first postpartum months: From a value of 0.29 at three months postpartum, it declined remarkably, to 0.08 at nine months postpartum, and began to increase again at about two years after the index birth (Figure 4). Pregnancies that started in the first eight months postpartum were essentially more likely to end in an induced abortion than were those occurring 9–24 months postpartum, a pattern that did not change notably after we controlled for the ef-

fects of age, marital status and parity (Table 2). The shape of the curve of the postpartum abortion ratio did not vary significantly by age or marital status. However, there was some variation by parity: The higher abortion ratio closer to the index birth appeared more clearly among women with two children than among those at other parities (not shown).

An examination of temporal changes in the abortion risk and abortion ratio within the first eight postpartum months reveals that on the whole, the trends in both of these indicators paralleled those observed among all women of reproductive age: a decrease up to the mid-1990s and then a slight increase. However, the postpartum abortion risk among 25–34-year-old women increased sizably (Figure 5). Women aged 25–29 who gave birth in 1995 and 1996 had an abortion risk in the first eight months postpartum that was 1.5 times the risk for this group in 1987–1988. The corresponding relative risk among 30–34-year-olds was 1.2; in this age-group, most of the increase took place from 1992 onward. There was no such increase in the other age-groups, and the increase after eight months postpartum among 25–34-year-olds was smaller (not shown).

Among 25–29-year-olds, the increase in the postpartum abortion risk was accompanied by an increase in the abortion ratio; in contrast, among 30–34-year-olds, the postpartum abortion ratio increased only for the last few years examined (Figure 5). Parity and marital status made no difference in the temporal change in the abortion ratio.

Finally, the proportion of abortion patients who reported not having used any contraceptive method before getting pregnant was 39% if the pregnancy started 3–5 months after the index birth and was 32–35% later on. Among abortion patients who became pregnant within a year of the index birth, 52% had used a condom; the proportion was 46% after 18 months from the index birth. The share of those who had used the pill or IUD was 6% at 3–5 months

FIGURE 5. Abortion risk and abortion ratio within the first eight months postpartum relative to 1987–1988 value, by year of index birth, according to age
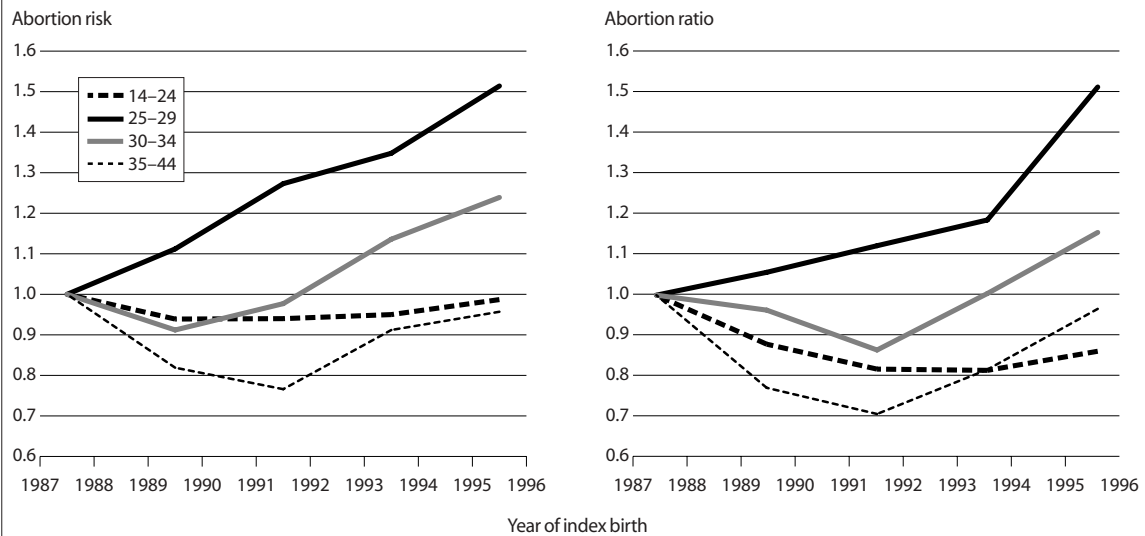
Note: Relative risks were estimated by models including time elapsed since index birth, parity and the interaction of age and year, where the year of the index birth was grouped into two-year groups.

postpartum and 8% at 9–12 months postpartum and later. These data suggest that effective contraceptive methods were used somewhat less often within the first eight months from delivery than they were later on.

DISCUSSION

Using a large, register-based data set that covered all pregnancies in Finland over a 12-year period enabled us to study postpartum pregnancies in detailed intervals. To our knowledge, the curves showing the distributions of postpartum conceptions or abortions have never before been estimated on the basis of such data.

The low abortion ratio that we found among pregnancies that started within 9–24 months from the last birth reflects the interval that Finnish families usually consider appropriate for the spacing of children.[21] Given that perspective, the reason that the proportion of pregnancies starting within eight months of the birth that ended in an induced abortion was large probably is that they occurred earlier than planned (if the couple or the woman wanted any more children).

Within the first eight months after a birth, the closer the conception was to the birth, the higher the abortion ratio was; this finding reinforces the interpretation that women and couples try to avoid closely spaced births. Since there were few conceptions in the first half-year after delivery, the high abortion ratio did not translate into a high abortion risk. The postpartum abortion risk became higher at 6–8 months after delivery, suggesting that more unintended conceptions occurred in that period.

We believe that prevailing family planning practices in Finland include a period of less-effective contraceptive use during the first year postpartum. This period begins at 3–4 months following delivery, when complementary feeding starts and the contraceptive effect of lactation decreases, and ends at around 6–8 months after delivery, when a sizable proportion of mothers stop breastfeeding, begin menstruating and start using effective contraceptive methods, such as the IUD or combined oral contraceptives. The increase in the abortion risk up to 6–8 months postpartum and the decrease thereafter are in accordance with this picture.

These results suggest the need to improve contraceptive practices after women start supplementary feedings, even if breastfeeding continues. Pregnant women need information on the recovery of fecundity during lactation, so they can properly use coitus-dependent methods (such as condoms and spermicides, complemented with emergency contraception). In addition, family planning clinics may need to widen the choice of contraceptive methods that they offer during the postpartum period: An IUD can be inserted safely during a postpartum health check at 6–8 weeks after delivery, or it can be inserted later during a period of lactational amenorrhea, if the possibility of pregnancy is excluded.[22] Progestin-based methods also can be used during breastfeeding without causing any problems with lactation or with the health of the baby.[23] Moreover, low-dose combined oral contraceptives can be used during breastfeeding, but they reduce the volume of breast milk.[24]

Although it has become increasingly common in recent decades in Finland for the first birth to occur in a consensual union,[25] women who were cohabiting at delivery had more than double the abortion risk of married women. Moreover, their abortion risk was particularly high 6–8 months after the birth. Cohabiting women also terminated a much higher share of their pregnancies than did married women, a finding seen elsewhere as well.[26] It is plausible that even if cohabiting women are strongly motivated to avoid pregnancy, they still may fail to do so if their contraceptive use in the postpartum period is inadequate.

Our measurement of marital status pertained to the time of delivery and was not updated in the follow-up period. This fact weakens the variable's validity the further we get from delivery, in particular because consensual unions are converted to marriage or are dissolved at high rates. However, marital status at delivery is still a good predictor of abortion risk, since abortion risks by marital status remained at different levels for the entire postpartum period.

The marked rise in the abortion risk within eight months postpartum among 25–34-year-old women was accompanied by an increase in the probability that a pregnancy starting soon after delivery was terminated. From a health care perspective, it is alarming that postpartum abortions are on the rise among 25–34-year-old women, who are at a stage in their lives when important decisions concerning the number and timing of children are made. In fact, 65% all children born in Finland in 1987–1998 were born to women in this age-group.

In discussions about abortion, it is frequently argued that certain subgroups of the population whose abortion risk is high or increasing cannot be reached easily by the health care system. This argument is not applicable to our analysis, however, as postpartum women are in frequent contact with the health care system. If health care professionals assume that women in this age-group know how to take care of contraception themselves, such women may receive less counseling about family planning. Whatever the nature of the increasing motivation of these women or their partners for not having another child might be, however, it is evident that family planning is inadequately realized by means of contraception.

High pregnancy and abortion risks among teenage mothers have been reported in many previous studies.[27] The very high level of postpartum abortion risk that we found among teenage mothers in the first half-year after delivery may be related to their shorter-than-average period of lactation. Nevertheless, Finnish teenage mothers' subsequent high level of abortion risk is somewhat surprising, since all teenage mothers come into contact with the health care system in connection with their pregnancy and delivery, and are supposed to receive appropriate contraceptive counseling.

While reducing the overall level of induced abortion is a worthwhile health policy goal, a focus on certain subgroups or on specific stages of the life course in which problems are encountered also is warranted. The prenatal and postpartum periods afford good opportunities to influence contraceptive behavior, since women are in close contact with the health care system during pregnancy and the first

months of the baby's life. Sexuality and contraception after delivery should be discussed when the mother or both parents visit the maternity clinic, and these matters should be a key topic in all of their contacts with the child welfare clinic until they have begun to use a reliable method.

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