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FACTORS BEHIND THE CHILDBIRTH EXPERIENCE – INFLUENCE ON FUTURE REPRODUCTION

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ACADEMIC DISSERTATION

To be presented, with the permission of the Faculty of Medicine of the University of Helsinki, for public discussion in Seth Wichmann Auditorium, Department of Obstetrics and Gynaecology, Helsinki University Women's Hospital, on 29th of September, at 12 o'clock.

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ABSTRACT

Maternity care in Finland has achieved a high level of safety during childbirth in worldwide comparisons. However, the quality of care cannot be evaluated based only on maternal or neonatal mortality and morbidity. As such, the maternal childbirth experience has been established as one crucial measurement to assess the quality of care. The childbirth experience has significant immediate and long-lasting implications on the wellbeing of the mother, the infant, and the entire family. The research questions in this study address the factors and consequences of the childbirth experience with the aim of better understanding the antecedents and consequences of both positive and negative childbirth experiences.

Several characteristics of the mother, the pregnancy, and delivery impact the childbirth experience. However, a wide variety of measurements, settings, and results require additional data to clarify the associations between the childbirth experience and the time of delivery, labour induction, and pain relief. It has been suggested that a negative childbirth experience might also be associated with fewer subsequent births although comprehensive data on the topic remain lacking.

This study utilises data from childbirth experiences collected at Helsinki University Hospital delivery units from January 2012 through December 2018 comprising more than 120 000 childbirths. The childbirth experience is measured using the ten-point visual analogue scale (VAS). Data on the childbirth experience covers 90% of parturients giving birth in the Hospital District of Helsinki and Uusimaa (HUS) delivery units during the follow-up period. These data were combined with register data from the Medical Birth Registry, which includes data on the mother, the pregnancy, childbirth, and the newborn up to seven days after delivery. Statistical analyses compared the average scores for the childbirth experience and the proportion of negative experiences according to the primary factors measured in this study. The likelihood of and interval for a subsequent birth were compared between negative and positive childbirth experiences.

The results indicate that most parturients perceived childbirth as a positive experience, although 9.5% of primiparas and 3.9% of multiparas rated their experience as negative. In this study, we found that timely differences on the childbirth experience were slight, possibly resulting primarily from organisational changes, the suppression of childbirth preparation classes, and the induction of labour. Specifically, labour induction and operative deliveries associated with more negative childbirth experiences. Furthermore, the association between pain relief and the

childbirth experience was complex and differed between parities. Generally, neuraxial analgaesia associated with a lower risk of experiencing a negative childbirth amongst multiparas, although it simultaneously decreased the likelihood of having a highly positive childbirth experience amongst both groups. A key finding from this study was that the childbirth experience associated with a lower likelihood and a longer interval for a subsequent child after the first negative experience. Thus, a negative childbirth experience affects not only the mother and her family, but also carries broader implications for society by potentially lowering the birth rate.

To conclude, risk factors associated with a negative childbirth experience should be taken into account in maternity care in order to provide a more positive childbirth experience for all parturients. Inducing labour without a clear medical indication should be avoided. Furthermore, the availability of a variety of pain relief methods should be flexible and continuous during labour and delivery. Parturients who have a negative childbirth experience should be offered additional care to restructure the experience, and, therefore, avoid long-lasting adverse effects.

TIIVISTELMÄ

Suomi on yksi maailman alhaisimman äitiys- ja lapsikuolleisuuden maita, joten synnytysten hoidon laatua ei voida arvioida pelkästään vakavien haittojen määrällä. Synnyttäjän kokemus on yksi keskeinen hoidon laadun mittari. Synnytyskokemuksella on osoitettu olevan merkittäviä välittömiä ja pitkäkestoisia vaikutuksia äidin, vauvan ja koko perheen hyvinvointiin. Tämä tutkimus selvittää synnytyskokemuksen osatekijöitä sekä synnytyskokemuksen yhteyttä syntyvyyteen.

Synnytyskokemukseen on yhdistetty useita äitiin, raskauteen ja synnytykseen liittyviä tekijöitä. Aiemmissa tutkimuksissa käytettyjen mittarien, asetelmien ja tulosten moninaisuus antaa syyn tutkia lisää synnytyksen ajankohdan, synnytyksen käynnistämisen ja kivunlievityksen yhteyttä synnytyskokemukseen. Kielteisen synnytyskokemuksen yhteydestä seuraaviin synnytyksiin on olemassa viitteitä aiemmassa kirjallisuudessa, mutta kattavaa tutkimusta aiheesta ei ole aiemmin tehty.

Tutkimuksessa käytettävä aineisto on kerätty Helsingin ja Uudenmaan sairaanhoitopiirin synnytyssairaaloissa vuosina 2012–2018 ja se käsittää kaikkiaan yli 120 000 synnytystä. Seitsemän vuoden aineisto sisältää synnytyskokemusarviot 90 % seuranta-aikana HUSissa synnyttäneiltä. Synnytyskokemus on mitattu kymmenportaisella Visual Analogue Scale -mittarilla. Synnytyskokemustiedot yhdistettiin kansallisen Syntyneiden lasten rekisterin tietoihin, joka sisältää äidin perustietojen lisäksi tiedot raskaudesta, synnytyksestä ja vastasyntyneestä seitsemän vuorokauden ikään saakka. Aineiston analyysissa käytettiin tilastollisia menetelmiä, joiden avulla selvitettiin synnytyskokemuksen osatekijöiden yhteyttä keskimääräiseen synnytyskokemukseen sekä kielteisten synnytyskokemusten osuuteen. Synnytyskokemuksen vaikutusta seuraavan synnytyksen todennäköisyyteen ja ajankohtaan vertailtiin ensimmäisen synnytyksensä kielteisenä tai myönteisenä kokeneiden välillä.

Tutkimustulosten mukaan useimmat synnyttäjät arvioivat synnytyskokemuksensa myönteiseksi, mutta 9,5 % ensisynnyttäjistä ja 3,9 % uudelleensynnyttäjistä kokee synnytyksensä kielteisenä. Tulosten mukaan ajallisten tekijöiden vaikutukset synnytyskokemukseen olivat vähäisiä, sillä eroja havaittiin vain vuositasolla sekä vuorokaudenajan mukaan. Synnytyksen käynnistäminen ja operatiivinen synnytys olivat yhteydessä kielteisempään synnytyskokemukseen. Käytetyn kivunlievityksen yhteys synnytyskokemukseen oli erilainen ensi- ja uudelleensynnyttäjillä. Epiduraalipuudutusten käyttö synnytyksessä oli uudelleensynnyttäjillä yhteydessä matalampaan riskiin kokea synnytys kielteisenä, vaikka samalla

se vähensi molemmilla ryhmillä todennäköisyyttä kokea synnytys erittäin myönteisenä. Kielteisen synnytyskokemuksen havaittiin olevan yhteydessä pienempään seuraavan synnytyksen todennäköisyyteen sekä pidempään aikaväliin synnytysten välillä. Siten kielteisen synnytyskokemuksen vaikutukset eivät kosketa vain äitiä ja hänen perhettään, vaan niillä voi olla alentuneen syntyvyyden kautta laajempia vaikutuksia yhteiskuntaan.

Tutkimuksessa havaitut kielteisen synnytyskokemuksen riskitekijät tulee huomioida synnytysten hoidossa, jotta yhä useampi synnyttäjä voisi saada myönteisen synnytyskokemuksen. Synnytysten käynnistämistä ilman selkeitä lääketieteellisiä perusteita tulee välttää. Erilaisten kivunlievitysmenetelmien tulee olla synnyttäjän saatavilla joustavasti synnytyksen aikana. Kielteisen synnytyskokemuksen kokeneille synnyttäjille tulee tarjota jatkohoitoa synnytyskokemuksen käsittelemiseksi, millä voidaan vähentää pitkäkestoisten haitallisten vaikutusten syntymistä.

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I've argued that a person aiming at the dissertation should have at least one of three characteristics – ambition to have a doctoral status, internal passion for the research topic or an opportunity that can't be refused. In the absence of others, I'm lucky I was offered the latest which also get me inspired by the topic.

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LIST OF ORIGINAL PUBLICATIONS

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I Joensuu, J., Saarijärvi, H., Rouhe, H., Gissler, M., Ulander, V. M., Heinonen, S., & Mikkola, T. (2021). Maternal childbirth experience and time of delivery: a retrospective 7-year cohort study of 105 847 parturients in Finland. *BMJ open*, 11(6).

II Joensuu, J. M., Saarijärvi, H., Rouhe, H., Gissler, M., Ulander, V. M., Heinonen, S., Torkki, P., & Mikkola, T. S. (2022). Maternal childbirth experience and induction of labour in each mode of delivery: a retrospective seven-year cohort study of 95 051 parturients in Finland. *BMC Pregnancy and Childbirth*, 22(1).

III Joensuu, J., Saarijärvi, H., Rouhe, H., Gissler, M., Ulander, V. M., Heinonen, S., Torkki, P., & Mikkola, T. (2022). Maternal childbirth experience and pain relief methods: a retrospective 7-year cohort study of 85 488 parturients in Finland. *BMJ open*, 12(5).

IV Joensuu, J. M., Saarijärvi, H., Rouhe, H., Gissler, M., Ulander, V. M., Heinonen, S., Torkki, P., & Mikkola, T. (2023). Effect of the maternal childbirth experience on a subsequent birth: a retrospective 7-year cohort study of primiparas in Finland. *BMJ open*, 13(3).

The publications are referred to in the text by their Roman numerals.

ABBREVIATIONS

ANCOVA	Analysis of covariance
ANOVA	Analysis of variance
BMI	Body mass index
CEQ	Childbirth experience questionnaire
CI	Confidence interval
DSS	Delivery satisfaction scale
FOC	Fear of childbirth
(a)HR	(Adjusted) hazard ratio
HUS	Hospital District of Helsinki and Uusimaa
IVF	*In vitro* fertilisation
MBR	Medical Birth Registry
NRS	Numeric rating scale
(a)OR	(Adjusted) odds ratio
OSF	Official Statistics of Finland
QACE	Questionnaire for assessing the childbirth experience
RR	Risk ratio
THL	Finnish Institute of Health and Welfare
VAS	Visual analogue scale
WHO	World Health Organisation
W-DEQ-B	Wijma Delivery Expectancy/Experience Questionnaire

INTRODUCTION

Childbirth can be one of the most important and memorable events in a woman's life. For a mother and her family, childbirth is not simply a medical occurrence, but rather a holistic life-changing event in which safety is always a primary factor. Physical and emotional safety are also crucial factors for the maternal childbirth experience, a highly subjective perception of a series of events and one which does not always follow the obstetric course of labour. The World Health Organisation (WHO) states in their recommendations for a positive childbirth experience (WHO, 2018) that labour management should focus not only mother and infant survival, but on allowing both to thrive and achieve their full potential vis-à-vis health and wellbeing.

The birthrate has declined significantly in recent decades in Finland, mirroring trends in other developed countries (Hellstrand et al., 2021). This development has major implications on the sustainability of Finland's welfare (Hiilamo, 2020; Tikanmäki & Seuri, 2020). Several reasons explain the declining birthrate including involuntary childlessness (Hetemäki, 2019; Hiilamo, 2020), changes in reproductive patterns amongst younger generations (Hetemäki, 2019; Hiilamo, 2020; Miettinen et al., 2015), a reduction in the total number of children (Hellstrand et al., 2021; Hetemäki, 2019), unstable partnerships (Hellstrand et al., 2021; Jalovaara & Fasang, 2017) educational factors including an incongruence between sexes (Hellstrand et al., 2021; Hetemäki, 2019; Hiilamo, 2020; Jalovaara et al., 2022), economic changes to society (Hiilamo, 2020), and socioeconomic differences (Jalovaara et al., 2022).

These macro-level consequences originate from highly individual reproductive decisions which reflect the surrounding society. In a survey amongst women aged 20 to 45, the reproductive intentions of the Finnish population were explored (Miettinen et al., 2015). More than one-fourth of those women who had a child rated the 'experiences of a previous pregnancy or a fear of childbirth' as a relatively important reason for delaying or not having a second child. This strongly suggests that the experiences of pregnancy and childbirth also influence (micro-level) individual reproductive decisions. The overall perception of the transition to parenthood was highly influenced by the childbirth experience, representing important and understudied factors in determining completed family size (Margolis & Myrskylä, 2015). In addition, a gap exists between the desired and achieved number of children (Miettinen et al., 2015). Despite the fact that the desired number of children typically exceeds the total number of children an

individual has, it is important to ensure that barriers are removed to having the desired number of children (Rotkirch, 2021).

Patient experience has been generally accepted as an important measure of the quality of care. Measuring patient experiences in the childbirth context has been utilised in Finland for the past decade. However, there is a need to determine the validity and applicability of measuring the childbirth experience in order to develop services based on considering the maternal experience and to identify those parturients who require additional support.

Childbirth is a natural event which does not necessarily require medical interventions. However, medical interventions are sometimes needed to ensure the safety and health of the mother and infant. Labour induction, the mode of delivery, and labour pain management are common factors in childbirth which might influence the maternal childbirth experience. Therefore, we need to investigate these factors' association with the childbirth experience in order to achieve a deeper understanding of how to ensure a positive childbirth experience for most parturients. A negative childbirth experience has been shown to have several adverse consequences on the health and wellbeing of the mother and the entire family. Specifically, the fear of childbirth amongst multiparas associates with a previous negative childbirth experience and, thus, should be identified and treated in order to avoid long-lasting adverse consequences. To that end, this dissertation explores the factors and consequences of the childbirth experience using a seven-year follow-up study of childbirth experience ratings from the Hospital District of Helsinki and Uusimaa (HUS) delivery hospitals.

REVIEW OF THE LITERATURE

This literature review consists of three parts. The first part introduces the concept of the childbirth experience. The second part summarises the literature on factors and consequences associated with the childbirth experience. The third part provides an overview of measuring the childbirth experience.

WHAT IS THE CHILDBIRTH EXPERIENCE?

Customer experience as a concept has inspired scholars and practitioners in recent decades (Holbrook & Hirschman, 1982; Schmitt, 2010). The roots of understanding the importance of the experience as a subjective and multidimensional phenomenon originate from the work of Holbrook and Hirschman (1982) and Pine and Gilmore (1998). During the past decade, however, customer experience has become an important concept in public and governmental organisations as well. The concept of the customer experience can be defined as a multidimensional construct comprising customer's cognitive, emotional, behavioral, sensorial, and social responses to an organisation's offerings during a customer's entire purchasing journey (Lemon & Verhoef, 2016). Customer experience as a concept thus refers to three characteristics of a customer's encounter: the subjectivity, multidimensionality, and the formation of a continuum of interactions (Becker & Jaakkola, 2020). First, the subjective nature of the customer experience includes both intrasubjective — the experience forms in the customer's mind and is influenced by their personality and history — and intersubjective – constructed within the surrounding social system with specific norms and values – perspectives (De Keyser et al., 2015). Second, the customer experience is multidimensional, comprising cognitive, emotional, physical, sensorial, and social elements (De Keyser et al., 2015; Lemke et al., 2011). And, third, the customer experience forms across a continuum of time through various interactions with an actor (Becker & Jaakkola, 2020; Lemon & Verhoef, 2016). Becker and Jaakkola (2020) identified the fundamental premise according to which the customer experience is a subjective perception the organisation plays a key role in monitoring, designing, and managing a range of stimuli that affect customer experiences. Managing the customer experience has been acknowledged as a strategic goal by scholars and practitioners (Homburg et al., 2017).

In the healthcare context, the customer experience has shifted to reflect the patient experience, corresponding to the evolution of the consumer

mindset in which the patient is not an object of actions, but rather an engaged partner aiming to achieve better health and wellbeing (Wolf & Jason, 2014). Despite the lack of consensus over the definition of patient experience, the Beryl Institute's definition, 'the sum of all interactions, shaped by an organisation's culture, that influence patient perceptions across the continuum of care', covers the most essential characteristics of the patient experience (Wolf & Jason, 2014). This definition aligns with the broader concept of patient-centred care, which is associated with several desirable clinical outcomes (Epstein & Street, 2011; Rathert et al., 2013). Patient experience has been recognised as an individual dimension of healthcare quality (Anhang Price et al., 2014; Oben, 2020).

In recent decades, the role and potential of the customer experience have also been discussed in the context of childbirth. The childbirth experience is defined as 'an individual life event, incorporating interrelated subjective, psychological, and physiological processes, influenced by social, environmental, organisational, and policy contexts' (Larkin et al., 2009). Within this definition, the childbirth experience is considered a process that primarily covers labour and delivery, but does not capture the entire experience in the continuum of interactions related to pregnancy and childbirth. However, the formation of the experience along the continuum of care encompasses the patient experience (Wolf & Jason, 2014) as well as the idea of the customer experience journey (Lemon & Verhoef, 2016). Although several factors in the childbirth experience can be identified, the experience itself is always subjectively constructed and does not necessarily follow the obstetric course of labour (Chabbert et al., 2021), thereby corresponding to the subjectivity of the customer experience (De Keyser et al., 2015). The childbirth experience has been characterised as complex and multidimensional (Chabbert et al., 2021; Hodnett, 2002), aligned with the multidimensional nature of the customer experience (Becker & Jaakkola, 2020; De Keyser et al., 2015). As such, the childbirth experience is influenced by many factors related to the parturient herself, the pregnancy, and the delivery. In parallel, the subjective experience is influenced by the surrounding cultural expectations, norms, and values (Chabbert et al., 2021; Nichols, 1996).

The childbirth experience is a highly meaningful or even transformative experience. In this regard, it differs from the typical customer experience where the intensity varies from an ordinary to an extraordinary experience (Becker & Jaakkola, 2020). Some parturients experience childbirth as an empowering event, whilst others experience it as negative or even traumatic (Chabbert et al., 2021; Olza et al., 2018). The childbirth experience represents an exception to other conventional customer experiences given that it might lead to clinically detectable adverse effects such as post-traumatic stress,

depressive symptoms, and a fear of childbirth during a subsequent pregnancy.

FACTORS AND CONSEQUENCES OF THE CHILDBIRTH EXPERIENCE

During pregnancy, parents prepare for the birth of and parenthood to the new baby. This is essential on the path towards a positive childbirth experience. In the Finnish maternity care system, antenatal clinics are responsible for offering support to families. Some delivery hospitals have organised childbirth preparation classes and visits to the delivery hospital for primiparas, but these have been largely limited and replaced with digital materials.

Several factors related to the childbirth experience have been identified in previous research. In this chapter, the most essential factors related to this study are presented in more detail and other factors are briefly summarised. At the end of this chapter, I introduce previous knowledge on the consequences of a negative childbirth experience.

MODE OF DELIVERY

An unknown process causes the onset of labour, which includes regular and painful uterine contractions that cause progressive dilation of the cervix. The expulsion phase of labour starts from the full cervical dilatation and ends with the delivery of the baby.

A vaginal birth represents the optimal and most common mode of birth for mother and infant since over 70% of parturients give birth vaginally (Heino et al., 2022). The spontaneous onset of labour is indicated when labour begins with contractions or with amniotic fluid leak. If cervical dilatation progresses too slowly, the labour might be accelerated through the augmentation of synthetic oxytocin. If slow progression occurs during the second phase of labour, expulsion may be assisted. In Finland, vacuum is currently the instrument used primarily since forceps are practically no longer used (Saisto et al., 2014). About 10% of all childbirths rely on instrumental vaginal deliveries.

During 35 to 36 weeks of gestation, a phycisian, mostly in the primary healthcare setting, evaluates a pregnant woman's possibilities to deliver the foetus vaginally. If anything poses a risk to a vaginal delivery, parturients are referred for an additional assessment in the delivery hospital. Sometimes, some medical issue contra-indicates a vaginal delivery and, thus, a caesarean section is considered the safest way to deliver. In Finland, the percentage of

caesarean sections reached 19.6% in 2021, a slight increase compared with the period before 2020 when it remained constant for decades. Finland has been a positive exception when compared with other Western countries, where the share of caesarean sections has sharply increased over the last two decades (Saisto & Ulander, 2020). This represents a success story since advanced maternal age and obesity in parturients have simultaneously become more common, representing key risk factors for caesarean sections (Heino et al., 2022). However, in the last few years, the share of caesarean sections has grown, indicating a possible change in this development (Figure 1).

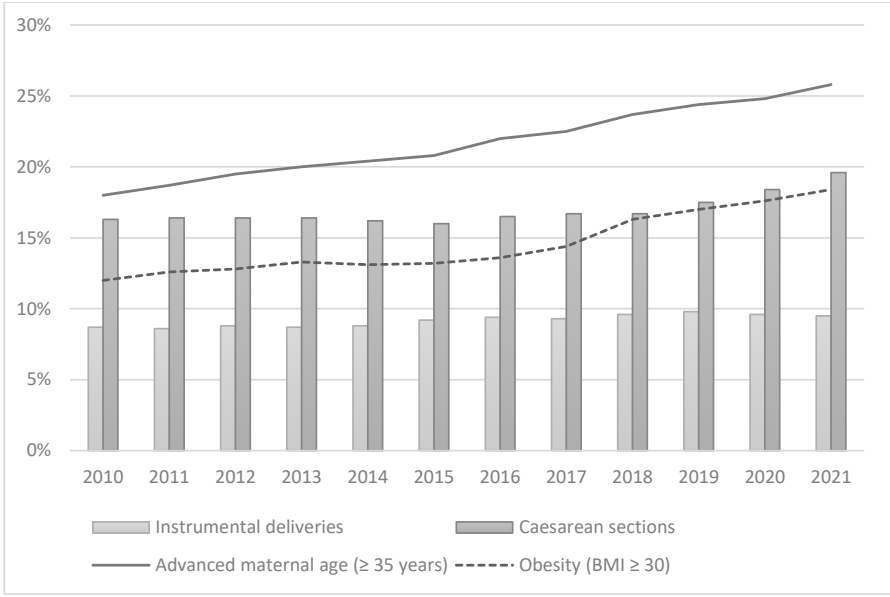

Figure 1 The annual percentage of caesarean section and instrumental vaginal deliveries combined with the percentage of mothers with an advanced maternal age and obesity (Heino et al., 2022)

Among all caesarean sections, 41% were elective whilst the remainder were unplanned, including 55% of urgent and 4% of emergency caesarean sections (Kiuru et al., 2022). Elective caesarean sections carry some desirable features according to obstetricians, since they can be performed within a short time period and scheduled during the day-time, which is impossible with spontaneous deliveries (Saisto & Ulander, 2020). The majority of elective caesarean sections proceed as planned and are perceived positively. They are also perceived as safe and a controlled way to give birth (Wiklund et al., 2008). Despite these desirable features, caesarean sections are also associated with more frequent obstetric risk factors (Pallasmaa et al., 2010; Pallasmaa &

Gissler, 2016), maternal complications, and a weaker health and wellbeing of the infant (Pallasmaa & Gissler, 2016; Sandall et al., 2018). Although an elective caesarean section associates with slightly more negative maternal outcomes, unplanned caesarean sections clearly carry worse maternal outcomes compared with elective caesarean sections (Pallasmaa et al., 2010).

The mode of delivery has been acknowledged as a significant predictor of the childbirth experience (Table 1). An operative delivery and non-elective caesarean section associated with a higher risk for a negative childbirth experience (Adler et al., 2020; Viirman et al., 2022) and a lower rated childbirth experience (Carquillat et al., 2016; Dencker et al., 2010; Kempe & Vikström-Bolin, 2020; Walker et al., 2015). Nevertheless, delivery is a process involving several phases resulting from the mode of delivery. It remains unclear how these preceding steps combined with the resulting mode of delivery impact the childbirth experience.

LABOUR INDUCTION

Full-term gestational age begins at 37 weeks. If spontaneous labour does not begin by 41 to 42 weeks gestation or some other concern arises related to the status of the mother or foetus, labour is induced. Thus, the induction of labour is an attempt to achieve a vaginal delivery when the continuation of a pregnancy is considered risky to the mother or the foetus (Heino et al., 2022; Kruit et al., 2016). In 2021, approximately 34% of all childbirths in Finland were induced, with the share increasing year by year (Heino et al., 2022). The most common indications for labour induction are late-term pregnancy (>40 weeks gestation) and the prelabour rupture of the membranes in a term pregnancy (Kruit et al., 2016). Gestational diabetes and hypertension are conditions for which the benefits of induction are thought to overweigh the risks. In addition, non-medical indications due to psychosocial and logistical reasons are also considered. However, clear knowledge of the optimal indications and timing for labour induction are being researched (Alkmark et al., 2020; Kauppinen et al., 2016; Kruit et al., 2022; Wennerholm et al., 2019). Labour induction relies on various methods, including oral or vaginal prostaglandin, a balloon catheter, synthetic oxytocin, and the artificial rupture of the membranes. Sometimes, a combination of these methods is required to initiate labour. Figure 2 illustrates the substantial increase in the percentage of labour inductions after 2010. This development might be partly explained by increased levels of obesity, a general advancing maternal age, and the increase in gestational diabetes amongst parturients (Kruit et al., 2022).

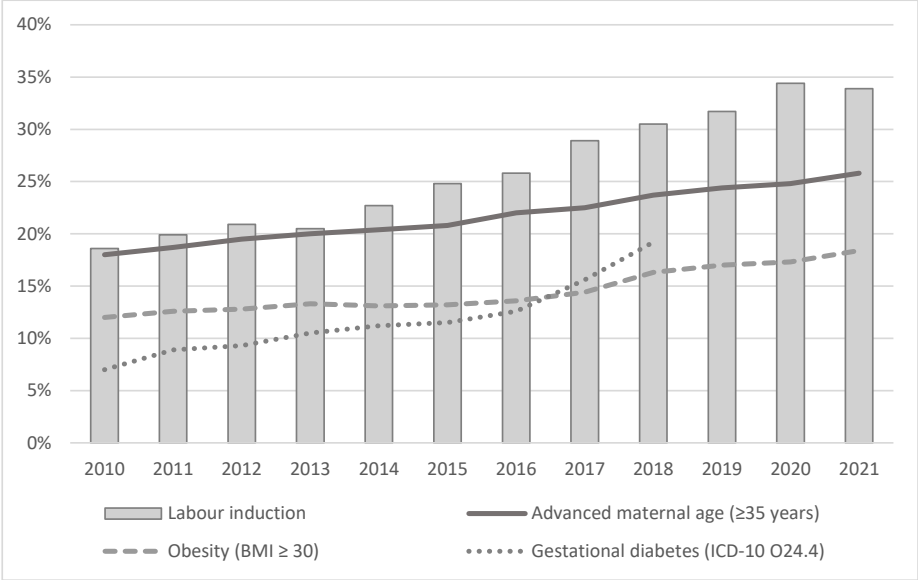

Figure 2 The annual proportions of labour induction considering percentages of the most ommon risk factors (Heino et al., 2022)

In the existing literature, labour induction has been associated with lower average childbirth experience ratings (Schaal et al., 2019) and a higher risk for a negative childbirth experience (Adler et al., 2020; Falk et al., 2019; Hildingsson et al., 2019; Waldenström, 2004). Furthermore, labour induction has been associated with a higher incidence of obstetrical interventions (Davey & King, 2016; Jacquemyn et al., 2012). Yet, it remains unclear how labour induction associates with the childbirth experience if the resulting mode of delivery is also considered.

LABOUR PAIN AND PAIN RELIEF

Labour pain is the most challenging and intense pain that most women experience during their lives (Lally et al., 2008). It is paradoxical by nature since this painful experience results in a positive outcome—the birth of a baby. In contrast to pathological pain, labour pain is part of a normal process providing a sign of labour onset and progression (Lowe, 2002). However, intense pain itself is not essential to delivery, but rather excessive pain may complicate or inhibit the progression of labour (Toivonen & Palomäki, 2019).

The experience of labour pain is highly individual with physiological and psychological factors couched in social and cultural characteristics including the attitudes, manners, and standards of the family as well as the maternal care system (Lowe, 2002). Most women describe intense pain during labour

and delivery, whereby some parturients cope well with the pain, whilst others consider the pain intolerable (Lowe, 2002; Whitburn et al., 2019). This productive and multidimensional nature to labour pain renders it distinct from other types of pain (Whitburn et al., 2019).

Various methods to relieve labour pain exist (Toivonen & Palomäki, 2019). During labour and delivery, healthcare providers help parturients make informed choices regarding pain relief. Pain relief methods suitable during labour management can be classified as non-medical pain relief, systemic pain relief, local analgesia, and neuraxial analgesia (Toivonen & Palomäki, 2019). Non-medical pain relief includes various methods, such as a water bath, acupressure, acupuncture, transcutaneous electrical nerve stimulation, intradermal injection of sterile water, and massage (Anim-Somuah et al., 2018). Systemic pain relief methods include parentral opioids, paracetamol, and nitrous oxide. A recent Cohrane review indicates that opioids carry adverse effects with only minor pain relief (Smith et al., 2018). Instead, nitrous oxide is one of the most-often utilised pain relief methods in Finland (55%) (Heino et al., 2022). Although its effectiveness in pain relief fluctuates between parturients, nitrous oxide has several benefits including its affordability and easy dosing by the parturient herself with no adverse neonatal effects (Toivonen & Palomäki, 2019). Pudendal and paracervical cord blocks are injections of local anesthesia with varying effectiveness. Neuraxial analgesia, including epidural, spinal, and combined-spinal–epidural techniques, is the most effective labour pain relief method (Anim-Somuah et al., 2018; Jones et al., 2012). Several studies demonstrated the safety of neuraxial pain relief methods according to maternal and neonatal outcomes (Anim-Somuah et al., 2018). Carrying few contraindications, epidural techniques have become the gold standard in labour pain management (Gizzo et al., 2014).

Pain relief during labour has been a topic of furious debate surrounding the rights of birthing women worldwide (Kosonen, 2019; Melzack, 1984; Skowronski, 2015). Although waves of these debates have reached Finland years later, a similar variety of attitudes towards pain relief during labour has been noted. In medicine historically, the pain of women has been neglected (Cleghorn, 2021). Ether, chloroform, and nitrous oxide were used as early attempts to medically relieve pain in the mid-nineteenth century. Nitrous oxide is still utilised for pain relief. The epidural was introduced for the management of labour pain by American anaesthesiologist John Bonica in the mid-twentieth century (Melzack, 1984). One anaesthesiologist, Riitta Jouppila, through her work in clinics, science, and politics, was influental in the general use of epidural analgesia for labour pain management in Finland (Jouppila et al., 1979; Jouppila & Hollmén, 1976). The effectiveness of epidural analgesia rather importantly changed labour pain management. However, parallel to the increasing reliance on epidural analgesia, the natural childbirth

movement accelerated opposition to the medicalisation of childbirth. In Finland, epidural anaesthesia became common during the 1980s and 1990s. Currently, although a majority of parturients having a vaginal delivery in Finland use an epidural (52.5%) or spinal (11.7%) analgesia during labour (Heino et al., 2022), aiming for a natural childbirth remains popular.

The association between the childbirth experience and pain relief has been examined in several studies. The epidural analgesia has been associated with a less positive childbirth experience (Fenaroli et al., 2019; Lindholm & Hildingsson, 2015; Stadlmayr et al., 2004; Waldenström et al., 2004). These results seem contradictory considering the effectiveness of epidural analgesia and the role of intense pain on the childbirth experience. Therefore, the association between pain relief and the childbirth experience requires investigation.

TIME OF DELIVERY

Various maternal and neonatal birth outcomes related to the time of delivery have been assessed (Butler et al., 2014; Pasupathy et al., 2010; Roberts et al., 2009; Stewart et al., 1998; Vandecruys et al., 2002). These outcomes might ignore important changes due to different time settings, such as caregiver fatigue or pressure on the staff. Thus, studies directly addressing the association between the childbirth experience and the time of delivery are also needed.

OTHER FACTORS

Previous research also detected other factors associated with the childbirth experience. Those factors impacting the childbirth experience are summarised in Table 1 combined with those described in more detail above. The associations between factors are complex and interrelated, requiring consideration of the confounding effects when analysed.

Table 1. *Factors associated with the maternal childbirth experience*

Maternal-related factors	**References**
Personality	Asselmann et al., 2021; B. Larsson et al., 2015; McKelvin et al., 2021; Schaal et al., 2020
Previous life experiences	Do et al., 2022; Gottfried et al., 2015; Henriksen et al., 2017; Leeners et al., 2016
Age	Aasheim et al., 2013; Smarandache et al., 2016
Obesity	Adler et al., 2020; Viirman et al., 2022
Socioeconomic status	Waldenström et al., 2004
Parity	Nystedt & Hildingsson, 2014; Poikkeus et al., 2014; Waldenström et al., 2004
Morbidity	Smarandache et al., 2016; Viirman et al., 2022
Pregnancy-related factors	
Unplanned or unwanted pregnancy	Smarandache et al., 2016
Fear of childbirth	Dencker et al., 2019; Nilsson et al., 2012; Rouhe et al., 2013; Waldenström et al., 2006
Delivery-related factors	
Labour induction	Adler et al., 2020; Falk et al., 2019; Hildingsson et al., 2019; Schaal et al., 2019; Waldenström et al., 2004
Duration of labour	Dencker et al., 2010; Fenaroli et al., 2019; Nystedt et al., 2005; Nystedt & Hildingsson, 2014; Walker et al., 2015
Pain	Henriksen et al., 2017; C. Larsson et al., 2011a; Whitburn et al., 2019
Pain relief	Fenaroli et al., 2019; Lindholm & Hildingsson, 2015; Stadlmayr et al., 2004; Waldenström et al., 2004
Oxytocin augmentation	Dencker et al., 2010; Soriano-Vidal et al., 2016; Walker et al., 2015
Mode of delivery	Adler et al., 2020; Carquillat et al., 2016; Dencker et al., 2010; Kempe & Vikström-Bolin, 2020; Viirman et al., 2022; Walker et al., 2015

Although several factors can be identified, prior research shows that the childbirth experience is much more than the obstetric sum of events during childbirth (Chabbert et al., 2021). The most important factor related to the childbirth experience is formed by childbirth professionals and interactions with them (Hodnett, 2002). The presence of caregivers during the management of childbirth, a good relationship with care providers, having sufficient information during childbirth as well as feeling the professionalism and supportiveness of midwives are all important factors resulting in a positive childbirth experience (Chabbert et al., 2021).

THE CONSEQUENCES OF THE CHILDBIRTH EXPERIENCE

The childbirth experience has been found to have several immediate and long-term consequences (Table 2). A negative childbirth experience

associates with a higher risk of post-traumatic stress, depressive symptoms, and anxiety following childbirth. These adverse maternal consequences also impact the mother–child bond and the couple's relationship. It has been suggested that these cumulative consequences may directly or indirectly impact plans to have a subsequent child (Gottvall & Waldenström, 2002; Shorey et al., 2018).

Table 2. *Consequences of a negative or traumatic childbirth experience*

Consequences of a childbirth experience	
Post-traumatic stress (disorder)	Ayers et al., 2016; Bailham & Joseph, 2003; Bell & Andersson, 2016; Mäkelä et al., 2021; Patterson et al., 2019; Slade et al., 2022; Steetskamp et al., 2022; Türkmen et al., 2021
Worse postpartum mental health status	Bay & Sayiner, 2021; Bell et al., 2016; Coo et al., 2021; Ponti et al., 2020; Türkmen et al., 2021
Challenges to mother–child bonding	Kjerulff et al., 2021; Ponti et al., 2020
Problems in a couple's relationship	Delicate et al., 2018; Handelzalts et al., 2018
Fear of childbirth	Dencker et al., 2019; Nilsson et al., 2010; Saisto & Halmesmäki, 2003; Størksen et al., 2013; Sydsjö et al., 2013
Elective caesarean section upon maternal request for a subsequent childbirth	Maimburg et al., 2016; Størksen et al., 2013; Turkmen et al., 2018
Longer interval for having a subsequent childbirth	Gottvall & Waldenström, 2002; Shorey et al., 2018

MEASUREMENT OF THE CHILDBIRTH EXPERIENCE

The childbirth experience is an abstract and multidimensional construct which needs operationalisation into a verbal form for measurement. Researchers lack clear consensus regarding which dimensions of the childbirth experience to capture as the most important. Thus far, various instruments have been developed to measure the childbirth experience, but no single measure has been considered clearly superior (see Table 3) (Nilvér et al., 2017).

Table 3. *Questionnaires measuring the childbirth experience*

Name	Dimensions	Number of items	References
Childbirth experience questionnaire (CEQ)	Own capacity, professional support, perceived safety, and participation	22	Boie et al., 2020; Dencker et al., 2010; Ghanbari-Homayi et al., 2019; Soriano-Vidal et al., 2016; Toivonen et al., 2020; Turkmen et al., 2018; Walker et al., 2015; Zhu et al., 2019
Wijma Delivery Expectations/Experience Questionnaire (W-DEQ-B)	Fear, lack of confidence, and expectations of the childbirth	33	Larsson et al., 2011; Rouhe et al., 2013
Delivery satisfaction scale (DSS)	Delivery and pain	8	Poikkeus et al., 2014; Rouhe et al., 2013; Saisto et al., 2001; Sälevaara et al., 2016
Questionnaire for assessing the childbirth experience (QACE)	Relationship with staff, emotional status, first moments with the newborn, and feelings at one-month postpartum	13	Carquillat et al., 2016, 2017; Coll et al., 2020, 2021

These measures of the childbirth experience carry diverse benefits, and most are excellent in research settings. They garner detailed information on several dimensions of the childbirth experience. However, they also carry some shortcomings, limiting their use as universal measures. First, the timing of measurement more than a few days after childbirth might be appropriate considering the time it takes to integrate the childbirth experience into one's mind. However, this timing obviously causes researchers to lose respondents compared with collecting responses in hospital. Second, detailed measures require quite a high level of linguistic functioning in order to answer a survey instrument properly and, thus, women who speak other languages are often excluded. Third, multidimensional and comprehensive measures require more effort from respondents and, therefore, they often lack respondents from socioeconomic minorities or various vulnerable individuals. In these questionnaire-based studies collected from two weeks to three months following delivery, the response rates varied from 39% (Toivonen et al., 2020) to 88% (C. Larsson et al., 2011b), although the majority of studies achieved a response rate of roughly 60% (Carquillat et al., 2016; Dencker et al., 2010; Soriano-Vidal et al., 2016; Walker et al., 2015).

A visual analogue scale (VAS) is a horizontal line with verbal anchors at the extremes of the scale. Whilst the wording changes according to the context, VAS has been used to measure pain, anxiety, mood, fear, and other subjective experiences (Ahearn, 1997; Heller et al., 2016; Vlaeyen et al., 1995; Wewers &

Lowe, 1990; Williams et al., 2010). In the childbirth context, it has been used to measure labour pain (Dencker et al., 2010; Saisto et al., 2001; Sheiner, et al., 2000a; Sheiner, et al., 2000b; Sheiner et al., 1999) and the fear of childbirth (Haines et al., 2011; Rouhe et al., 2009). In 1996, VAS was first used to measure satisfaction with childbirth alongside other measures (Capogna et al., 1996). Later, it was used to measure the childbirth experience or satisfaction with the childbirth experience in various studies (Dodd et al., 2004; Falk et al., 2019; Jafari et al., 2017; Johansson & Finnbogadóttir, 2019; C. Larsson et al., 2011b; Morgan et al., 1999; Shorten et al., 2005; Taavoni et al., 2013; Turkmen et al., 2018). During our project, more studies on the childbirth experience using VAS were published (Adler et al., 2020; Alkmark et al., 2021; Carlhäll et al., 2022; Goldkuhl et al., 2022; Kempe & Vikström-Bolin, 2020; Nilvér et al., 2021; Place et al., 2022; Viirman et al., 2022).

VAS is a simple and cost-effective measurement tool. Since in Finnish delivery hospitals conversations about childbirth routinely occur before discharge from the postpartum unit, the collection of VAS carries minimal costs. Using VAS, it is possible to avoid selection bias since it is also easy to use and understand amongst non-Finnish women. Although VAS does not allow for distinctions between the dimensions of experience, its superiority lies in its comprehensiveness, simplicity, and utility as an overall measure. Thus, VAS is a particularly valid measure for screening purposes. That said, recording VAS in a hospital database offers a valuable source of data via which to detect changes in the childbirth experience, for instance, following possible changes in maternity care services. In addition, VAS has been successfully tested against more detailed measurement instruments, such as the childbirth experience questionnaire (CEQ) (Place et al., 2022; Turkmen et al., 2018) and the Wijma Delivery Expectations / Experience Questionnaire (W-DEQ-B) (C. Larsson et al., 2011b). Moreover, the questionnaire for assessing the childbirth experience (QACE) was validated against the numeric rating scale (NRS), which is quite similar to VAS (Carquillat et al., 2016).

As a universal measure of the childbirth experience, VAS overrides other measures due to its simplicity and utility in hospital practice. The study summarised herein evaluates its validity as a measure of the childbirth experience utilising comprehensive registry data.

AIMS OF THE STUDY

This study aims to better understand the factors related to and the consequences of the childbirth experience via four research questions:

1. How is the time of delivery related to the childbirth experience (study I)?
2. How are labour induction and the mode of delivery related to the childbirth experience (study II)?
3. How do pain relief methods used during labour associate with the childbirth experience (study III)?
4. How does the first childbirth experience impact the interval or likelihood of having a subsequent birth (study IV)?

Additionally, the four complementary studies also validate the VAS measurement as an applicable measure of the childbirth experience.

CONTEXT, DATA, AND METHODS

CONTEXT

This research project retrospectively analysed register data combining childbirth experience assessments from the Helsinki University Hospital (HUS) database with data from the Medical Birth Register (MBR) from the Finnish Institute of Health and Welfare (THL). The institutional review board provided permission (HUS/438/2020) to use the data and waived the requirement for informed consent and a separate ethical committee review for the study since it was purely register-based.

In Finland, a total of 49 069 women gave birth in 2021, resulting in 49 598 newborns (Official Statistics of Finland (OSF): Births, 2023). More than one-third of all childbirths (17 376) occurred in HUS delivery units (Heino et al., 2022). On average, Finnish women gave birth to their first baby at the age of 30.0 years in 2021. Both the age of primiparas and the average age of all parturients have risen in recent decades, with the age of primiparas climbing to 31.6 years in 2021. The birthrate has continued declining in Finland since 1973, reaching an all-time low (1.35) in 2019 (OSF: Births, 2023; Hellstrand et al., 2020). Subsequently, it has continued declining despite unexpected growth in 2020 and 2021 (Rotkirch, 2022), reaching the lowest birth rate of 1.32 in 2022 (OSF: Births, 2023).

This study explored the childbirth experience in HUS delivery units. HUS oversees delivery hospital services in the Helsinki and Uusimaa area in southern Finland. During the study years, HUS had six delivery hospitals: Women's Hospital, Kätilöopisto, Espoo, Lohja, Hyvinkää, and Porvoo Hospitals. Porvoo Hospital was decommisioned in December 2016 followed by Kätilöopisto in October 2017. All deliveries in the HUS area take place in these delivery units, since home births are also recorded in MBR by delivery hospital. The number and risk profile of parturients differ between these delivery units. In 2018, 56.5% of childbirths in the HUS area took place in the Women's Hospital (n = 8969), 25.7% in the Espoo Hospital (n = 4080), 11.4% in the Hyvinkää Hospital (n = 1802), and 6.4% in the Lohja Hospital (n = 1022). Risky pregnancies including multiple pregnancies were primarily managed in the Women's Hospital and in Espoo Hospital.

Giving birth at a delivery hospital in the HUS area generally follows the characteristics described earlier. However, some deviations could be detected. The HUS area is the most densely populated region in Finland, although it is sparsely populated in comparison with some other countries. The average age of primiparas (30.6 years) is highest and the share of

parturients at an advanced maternal age (≥35 years) is highest (27.3%) in the HUS area compared with the rest of the country (25.7%) (Heino et al., 2022). The share of immigrants in the HUS area is also higher than in the rest of Finland, and they also have more children than native Finnish women. In the HUS area, one in four parturients is foreign-borne, whilst in the rest of the country, that same figure falls to one in seven (Helminen, 2018). The total birthrate was lowest in the HUS area (OSF: Births, 2023) compared with the rest of the country, but the decline in births during the last decade was smaller due to internal migration in Finland.

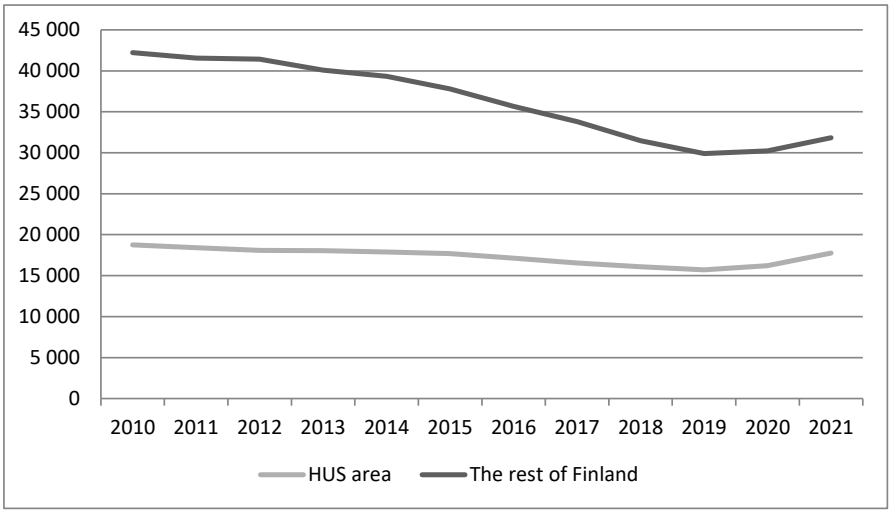

Figure 3 Number of births in the HUS area and in the rest of Finland, 2010–2021 (Heino et al., 2022)

CHARACTERISTICS OF THE FINNISH MATERNITY CARE SYSTEM

In Finland, maternity services are widely utilised since the majority of pregnant women (99.5%) visit maternity health clinics regularly (Saisto & Ulander, 2020) and a majority of childbirths take place in delivery hospitals (99.5%) (Gissler & Kiuru, 2019). Some women also fill in the gaps from these public services by purchasing privately provided services (i.e., doulas, childbirth preparation classes, various treatments, and maternal physiotherapy). The provision of these services has increased in recent decades, possibly indicating that some pregnant women need additional support or care and have the financial resources for them.

During pregnancy, women and their foetuses are monitored in maternity health clinics (*neuvola*) mostly by public health nurses (Klemetti & Hakulinen-Viitanen, 2013). In addition, pregnant women have at least two clinical

examinations by a physician at gestational weeks 10–18 and 35–36. Extra examinations are provided if needed. Women can also be referred to the delivery hospital if they need special observation for various reasons (i.e., maternal morbidities, pregnancy abnormalities/disorders, foetal malpresentation, a fear of childbirth, hypertension, and for late-term pregnancy).

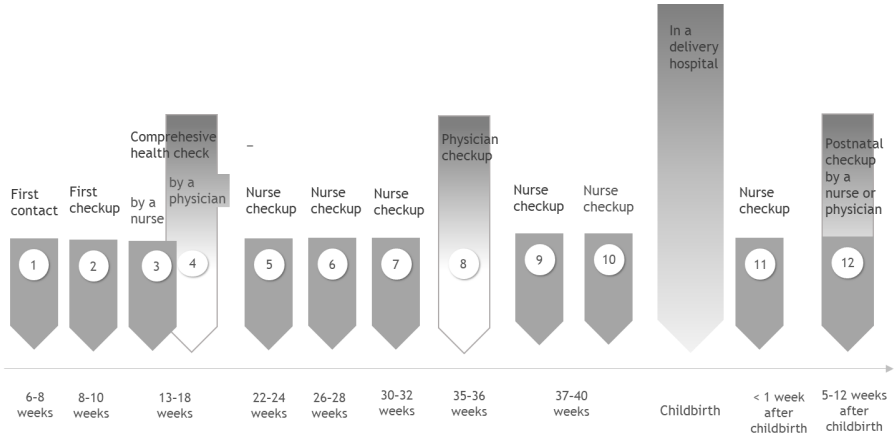

Figure 4 Schedule of maternal care visits in Finland. Modified from Klemetti & Hakulinen-Viitanen, 2013.

During a normal pregnancy at the onset of delivery, the woman arrives to the delivery hospital or may contact the delivery hospital seeking advice regarding how to relieve pain at home and when to arrive at the hospital. In the maternity hospital, the parturient is assigned to a midwife, who primarily takes care of the mother and neonate during delivery in co-operation with other midwives. An obstetrician or an anaesthesiologist is called upon only when necessary. A midwife checks the status of labour and asks about the wishes of the parturient. However, the midwife may be responsible for several childbirths simultaneously, and, therefore, continuous support is not always possible. Most parturients have a partner or a support person in the delivery room with them. This has been shown to positively impact the experience of parturients (Lemola et al., 2007).

Antenatal care as a whole, including several ultrasound screenings, is free to parturients in Finland. Costs related to childbirth for which the parturient is responsible are based on their attendance and stay in a delivery hospital and a postnatal unit rather than procedures performed during childbirth.

In Finland, antenatal care is distinct from the delivery hospitals. The maternity health clinic cares for pregnant women and their partner until the

onset of labour, upon which time responsibility for care transfers to the delivery hospital. If any concerns related to the pregnancy or childbirth occur, the maternity clinic refers the woman to the delivery hospital for a prenatal checkup, and high-risk pregnancies are generally followed in the delivery hospital. The Finnish maternity care system is part of the ambitious idea of a continuum of care, which combines maternity and child health clinic care overseeing the health and wellbeing of the entire family from the beginning of the pregnancy up to the year a child begins school. Nevertheless, delivery is an exception, taking place in delivery hospitals distinct from this continuum of care.

The Finnish maternity care model could be described as a shared model of care, in which responsibility for care is shared between professionals, whilst other care models also exist in international comparisons (Sandall et al., 2016). The Finnish delivery system is based on midwives and obstetricians who work in shifts. Due to this, it is not rare that the midwife caring for a woman may change during labour and delivery, possibly inhibiting the childbirth experience (Bohren et al., 2017).

Childbirth is a natural process typically not requiring obstetric interventions. Normally, childbirth is organised to take place in hospital. Although modern obstetric care has made birthing exceptionally safe, assessing the quality of care from the parturient's perspective is rather recent. However, in addition, ensuring the health and safety of the infant and mother, a midwife's role has always included mental support to the birthing woman (Kosonen, 2019; Sandall et al., 2015). By the end of the twentieth century, the childbirth experience was acknowledged as an important indicator of the quality of maternal care.

As an exception to the success story of Finnish maternity care in a global comparison, birth activists have critisised the Finnish maternal care system for being intervention-oriented and highly medicalised, neglecting the mother in the middle of these events. The activistic movement '*Minä myös synnyttäjänä*' brought the rights of birthing women to the centre of public conversations in Finland in the wake of worldwide #metoo movement. That movement launched the term 'obstetric violence' and provoked a broader debate regarding the maternity care system. These voices, combined with decreasing fertility rates and findings from a national survey amongst many people of childbearing age who want more children than they have (Miettinen, 2015), inspired the research summarised here. This research aims to better understand the childbirth experience and its consequences in Finland.

DATA

The data in this study were collected in HUS delivery units between January 2012 and December 2018, encompassing 120 437 childbirths resulting in 122 102 newborns. We excluded deliveries consisting of multiple births (1.4%), stillbirths (0.2%), deliveries outside a hospital (0.3%, except in study I), and preterm (<37 weeks gestational age) births (5.0%, except in study I; see Figure 5). The total number of childbirths following these exclusions was 112 952. The VAS ratings of the childbirth experience were collected from 89.7% of parturients, resulting in 101 317 eligible participants.

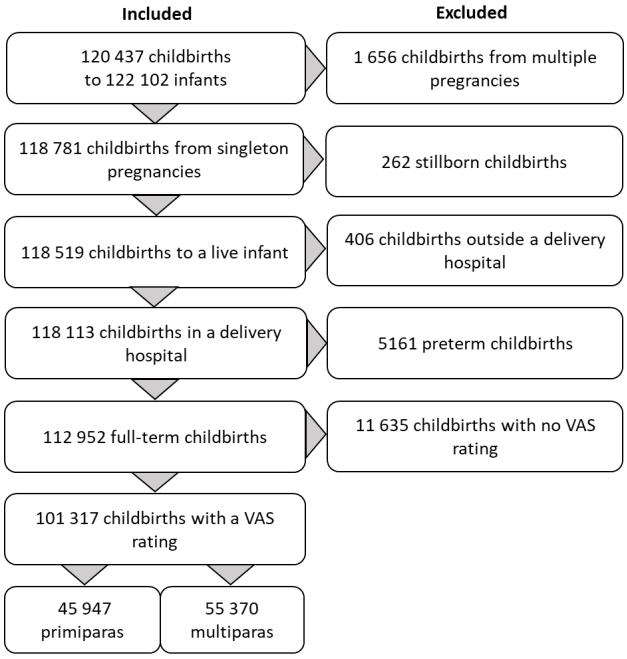

Figure 5 The inclusion criteria of eligible parturients

The childbirth experience was rated using VAS, with a score from 1 to 10 (1 indicating a very negative experience and 10 indicating a very positive experience). VAS was rated during a conversation between the parturient and midwife before discharge from the postpartum unit and typically usually less than three days (varying between one and five days) after delivery. Midwives were trained to create an atmosphere as safe as possible in order to safeguard the reliability of answers. Parturients were asked to use a validated VAS ruler to respond, but were also allowed to provide a verbal numeric response. VAS ratings were recorded in the hospital database.

Data on childbirth experiences were combined with data from MBR using mothers' identification numbers. MBR is a compulsory national register

maintained by THL. MBR includes data about the mother, pregnancy, delivery, and infant up to the seven days postpartum. Furthermore, the seven-year data from 2012 through 2018 allowed us to determine the likelihood of a subsequent birth after a first childbirth. All data utilised in this study except for the VAS ratings were collected from MBR.

In study I, we included all childbirths which took place in HUS delivery hospitals for singleton live births. In study II, we excluded elective caesarean sections since we studied the influence of labour induction on the childbirth experience. In study III, which addresses the association between the childbirth experience and pain relief methods used during labour and delivery, we excluded both elective and non-elective caesarean sections. In study IV, we followed women who had their first full-term singleton birth during the study period until their second childbirth.

METHODS

The childbirth experience was measured using a 10-point VAS scale. We, thus, divided the VAS ratings to reflect negative (VAS = 1–5) and positive (VAS = 6–10) childbirth experience groups (studies I, II, and IV) for most analyses, whilst studies I and II also relied on the average VAS scores. In study III, the VAS rating was divided into three categories, consisting of negative (VAS ≤ 5), positive (VAS = 6–8), and highly positive (VAS = 9–10) childbirth experiences. Although we primarily focused on detecting risk factors for a negative childbirth experience, the more subtle changes in experiences due to the pain relief methods used required more detailed classification.

Across all studies, we conducted separate analyses for primiparas and multiparas. Both groups were analysed in studies I, II and III. Study IV addressed the interval between the first and second childbirth and thus included only parturients giving birth to a first child in HUS delivery units between 2012 and 2018.

Numerical data were analysed using quantitative methods. The appropriate statistical analysis (Table 4) was employed to clarify the associations between the childbirth experience and factors impacting it as well as its influence on the interval between subsequent childbirths. We considered $p < 0.05$ as statistically significant.

Table 4. *The statistical methods and primary outcomes from studies I–IV*

	Statistical method	Outcome
Study I	ANCOVA, ANOVA, t-test, z-test, and RR	Average childbirth experience and proportion of negative experiences
Study II	ANCOVA, OR, and aOR	Average childbirth experience and proportion of negative experiences
Study III	Multivariate logistic regression	aORs referenced to a positive childbirth experience
Study IV	Cox regression, Kaplan–Meyer analysis	Interval and likelihood of having a subsequent baby

Abbreviations: ANCOVA, analysis of covariance; ANOVA, analysis of variance, RR, risk ratio; OR, odds ratio; aOR, adjusted odds ratio.

In study I, the mean differences between specific time units were compared using the analysis of covariance (ANCOVA) method. Before the primary analysis, t-tests, analysis of variance (ANOVA), and the Kruskall–Wallis test were used to determine reasonable periods of years, months, quarters, weekdays, and hours. The primary analysis compared the means of the childbirth experience between these periods. This association was then clarified by adjusting for the confounding effects of other factors (e.g., age of mother, pre-pregnancy body mass index [BMI], gestational age, and marital status). In addition, the risk ratios (RRs) for a negative childbirth experience (VAS = 1–5) were calculated to understand the differences.

Study II analysed the association between labour induction and the childbirth experience taking into account the mode of delivery. Labour induction was defined in our study as any attempt to artificially induce labour. MBR records the induction methods including the artificial rupture of the membranes, oxytocin, prostaglandin, and a balloon catheter, which might have been used in parallel with the onset of labour. The analysis was conducted in three phases. First, the two-way ANCOVA was utilised to determine the effects of labour induction and the mode of delivery on the childbirth experience. The effects of the confounding factors were also controlled for in the model. Second, we analysed the risk of a negative childbirth experience (VAS = 1–5) between spontaneous and induced labours for each mode of delivery. Odds ratio (OR) estimates with 95% confidence intervals (CIs) were used to compare groups. Third, we calculated the relative

risks with 95% CIs to assess the prevalence of each mode of delivery between spontaneous and induced labour.

Study III analysed the association between the childbirth experience and pain relief methods. MBR data include a range of pain relief methods. We classified the methods as epidural (including epidural, spinal, and combined spinal–epidural blocks), non-epidural (including paracervical and pudendal blocks, nitrous oxide, and other medical pain relief such as opioids), and none or non-medical (including acupuncture, acupressure, sterile water injections, massage, and a water bath) pain relief methods. We processed them as ordinal categories such that a parturient receiving both an epidural and nitrous oxide was classified into the epidural group and, consequently, the parturient using both a water bath and opioids was classified as falling within the medical, but non-epidural group.

Multivariate regression models were used to investigate the association between the pain relief methods used and the childbirth experience. The childbirth experience was classified along three categories, as a negative (VAS = 1–5), positive (VAS = 6–8), and highly positive (VAS = 9–10) childbirth experience. A positive childbirth experience served as the reference category, whereby the negative and highly positive categories were compared. The confounding effects of maternal and neonatal factors, oxytocin use, the duration of labour (both first and second phases), and the mode of delivery were adjusted in the analysis. The duration of the first phase of labour was calculated from the beginning of painful and regular contradictions occurring more frequently than every 10 minutes until full cervical dilatation (10 cm). The second phase of labour was calculated from the start of active expulsion until birth. Study IV focused on the association between the first childbirth experience and subsequent deliveries. The Kaplan-Meyer analysis was used to compare the interval from the first to a subsequent childbirth between those rating their first childbirth experience as negative or positive. We also utilised the Cox regression model to compare the likelihood of having a subsequent childbirth during follow-up. That allowed us to control for the effects of confounding factors influencing the likelihood of having a subsequent delivery.

RESULTS

In total, 101 317 eligible parturients were analysed, amongst whom 45% were primiparas and 55% were multiparas. A negative childbirth experience was more common amongst primiparas (9.5%) compared with multiparas (3.9%; RR = 2.4; 95% CI 2.31–2.56). The average VAS was lower amongst primiparas [8.03 (95% CI 8.01–8.04)] than amongst multiparas [8.47 (95% CI 8.45–8.48)]. The number of childbirths declined over the follow-up period by on average 2.1% annually.

The results from studies I–IV are briefly summarised in the subsections below. More complete descriptions of the study data and our findings appear in the published articles. Each subsection addresses one of the specific aims of the broader project.

THE CHILDBIRTH EXPERIENCE AND PARITY

The differences in childbirth experiences between primiparas and multiparas were assessed comparing the proportions of negative, positive, and highly positive childbirth experiences (Figure 6). The childbirth experience was highly dependent on parity [$\chi^2(2) = 4174.1$, $p < 0.001$]. Most primiparas (90.5%) and multiparas (96.1%) assessed their childbirth experience as at least positive. The share of highly positive experiences was much higher in multiparas (60.1% vs. 40.8%), whilst the share of negative experiences was higher in primiparas (9.5% vs. 3.9%). Thus, primiparas and multiparas were analysed separately in studies I, II, and III.

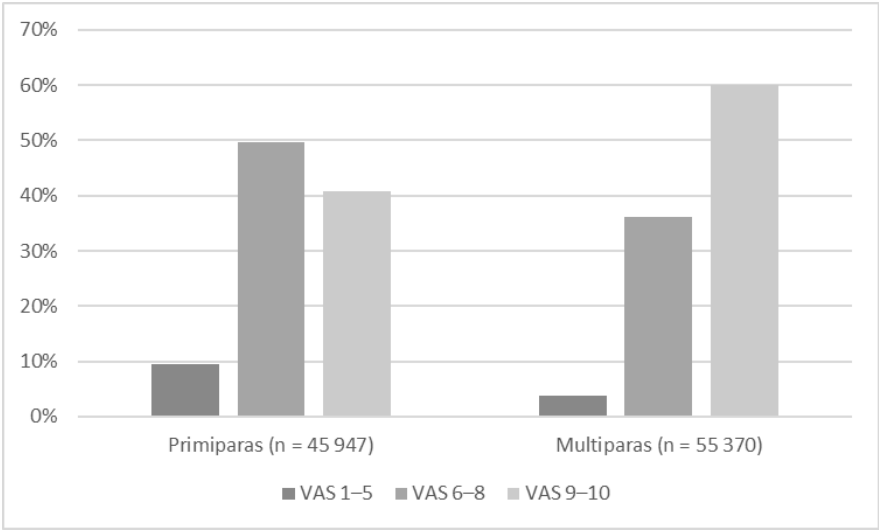

Figure 6 The proportion of negative (VAS = 1–5), positive (VAS = 6–8), and highly positive (VAS = 9–10) childbirth experiences by parity

THE CHILDBIRTH EXPERIENCE AND TIME OF DELIVERY

We also assessed how the time of delivery in terms of the specific year, month, quarter, weekday, and time of day affected the childbirth experience (study I). Our initial analysis scrutinised the distribution of VAS scores for each time interval. However, we found significant differences only at the level of year and time of day (Figure 7). In primiparas and multiparas, we detected a fall in the VAS between 2012 and 2016 [7.97 (95% CI 7.95–7.99)] and between 2017 and 2018 [8.49 (95% CI 8.47–8.52)]. Amongst multiparas, the changes were two-fold: the average VAS rose in the period 2012–2013 [8.54 (95% CI 8.51–8.56)] and the period 2014–2016 [8.60 (95% CI 8.58–8.61)], whilst detecting a decline between 2014–2016 and 2017–2018 [8.49 (95% CI 8.47–8.52)].

We also observed a corresponding rise in the risk of a negative childbirth experience between 2012–2016 and 2017–2018, from 8.8% to 11.4% (RR = 1.3, 95% CI 1.24–1.38) amongst primiparas. Significant changes in the risk of a negative childbirth experience amongst multiparas occurred between 2014–2016 (3.6%) and 2017–2018 [4.8%; RR = 1.3 (95% CI 1.20–1.45)]. These risks of negative childbirth experiences were analysed separately in each of the delivery units. Our analysis revealed that more negative experiences were reported in large delivery units. The risk change in the smallest unit amongst

primiparas was rather minor (from 5.3% to 5.5%) between 2014–2016 and 2017–2018, respectively. Corresponding risks in two larger units, comprising more than 70% of the deliveries examined here, were from 8.3% to 13.5% for 2014–2016 and 2017–2018.

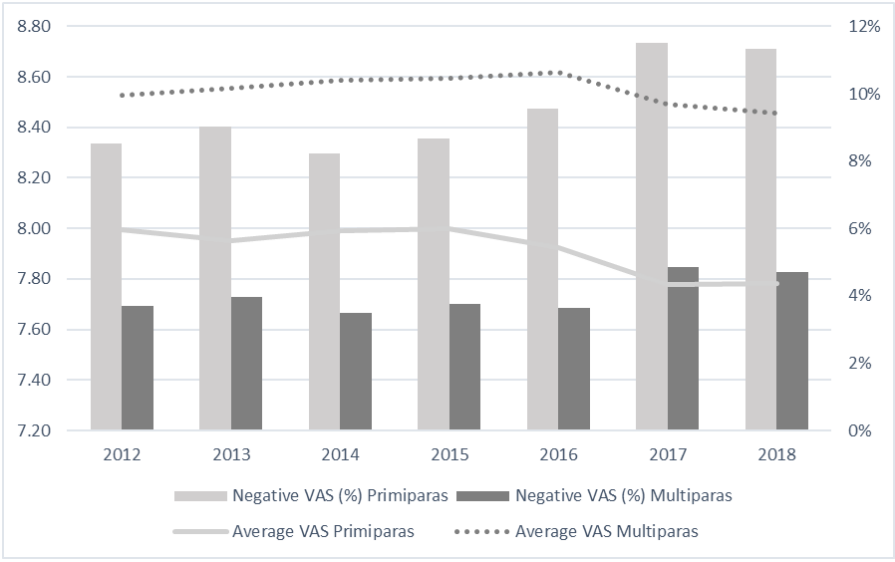

Figure 7 The annual average VAS (scale on the left) and percentage of negative childbirth experiences (VAS ≤ 5; scale on the right)

Monthly differences were not detected nor were differences between quarters for years beginning with January. An initial analysis of weekdays appeared to reveal a lower VAS on Sundays; however, adjusting the effect for the mode of delivery rendered those differences no longer significant. The time of day was classified on an hourly basis as night (00–08), office hours (08–16), and evening hours (16–24). These results differed between primiparas and multiparas. Primiparas reported a higher VAS during office hours [7.97 (95% CI 7.94–7.99)] compared with evening [7.90 (95% CI 7.87–7.92)] and night [7.91 (95% CI 7.88–7.94)]. Multiparas reported a higher VAS during both office hours [8.57 (95% CI 8.55–8.59)] and night [8.56 (95% CI 8.54–8.58)] compared with evening [8.52 (95% CI 8.50–8.54)].

THE CHILDBIRTH EXPERIENCE, LABOUR INDUCTION, AND THE MODE OF DELIVERY

The share of induced labours reached 27% amongst primiparas and 21% amongst multiparas (study II). We conducted the analyses in three phases to clarify the complicated associations between labour induction, the mode of delivery, and the childbirth experience. First, a two-way ANCOVA revealed a negative relationship between labour induction and the childbirth experience in both parity groups. This negative effect also remained after controlling for the effect of the mode of delivery and other confounding factors (Figure 8). For both parity groups, the average decline in the childbirth experience due to induction was about 0.2 points. However, the impact of the mode of delivery seems to be stronger. Second, our results for the OR estimates indicate that labour induction produces higher odds for both primiparas (OR range, 1.54–1.70) and multiparas (OR range, 1.43–1.74) of having a negative childbirth experience for all modes of delivery except for an emergency caesarean section, which did not reach statistical significance due to the low number of observations. Third, we calculated the relative risks for each mode of delivery group when labour was induced compared with the spontaneous onset of labour. The relative risks revealed that amongst primiparas labour induction more seldom resulted in a vaginal delivery (RR = 0.8, 95% CI 0.76–0.79) whilst the risk of an urgent (RR = 2.5, 95% CI 2.40–2.62) and emergency section (RR = 1.4, 95% CI 1.16–1.70) were higher amongst induced labours. In multiparas, the likelihood of having a vaginal delivery following induction was lower (RR = 0.9, 95% CI 0.91–0.93). Correspondingly, the risk for operative deliveries including instrumental vaginal deliveries and non-elective caeserean sections was higher amongst induced labour deliveries (RR range, 1.46–2.56).

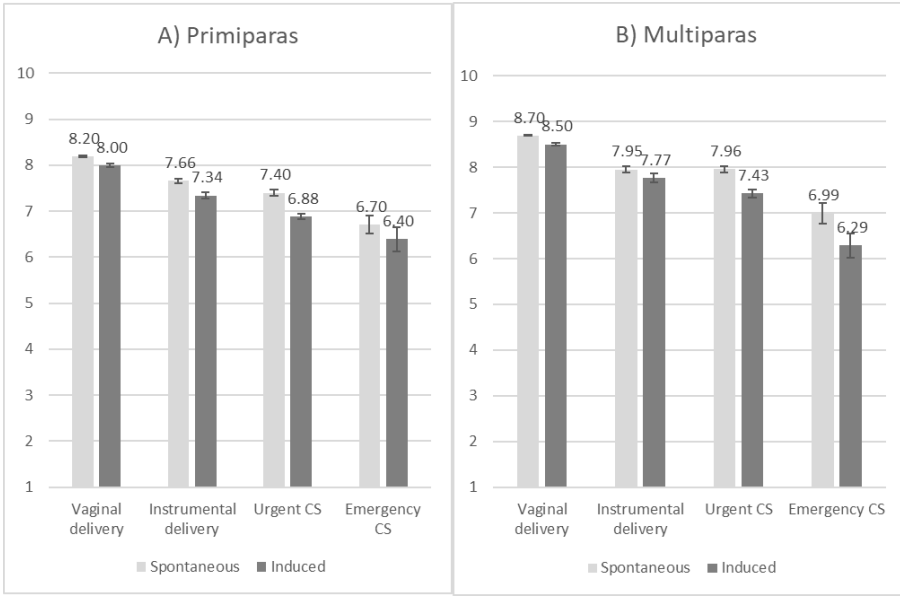

Figure 8 The average childbirth experience rating with 95% confidence intervals for induced and spontaneous labour in groups based on mode of delivery (Abbreviations: CS, caesarean section)

THE CHILDBIRTH EXPERIENCE AND PAIN RELIEF

Amongst 94 442 parturients who had a vaginal delivery, 90% assessed the childbirth experience using VAS, resulting in 36 835 (43.1%) primiparas and 48 653 (56.9%) multiparas (study III). The pain relief data were diverse and many parturients used several pain relief methods during labour and delivery. In primiparas, 30 668 (83.3%) parturients used an epidural (including epidural, spinal and combined epidural, and spinal blocks) and 4523 (12.3%) parturients used a medical but non-epidural pain relief. The remaining parturients (1644, 4.5%) fell into the none or non-medical group. The corresponding numbers amongst multiparas were 30 250 (62.2%), 10 968 (22.5%), and 7435 (15.3%), respectively (Figure 9).

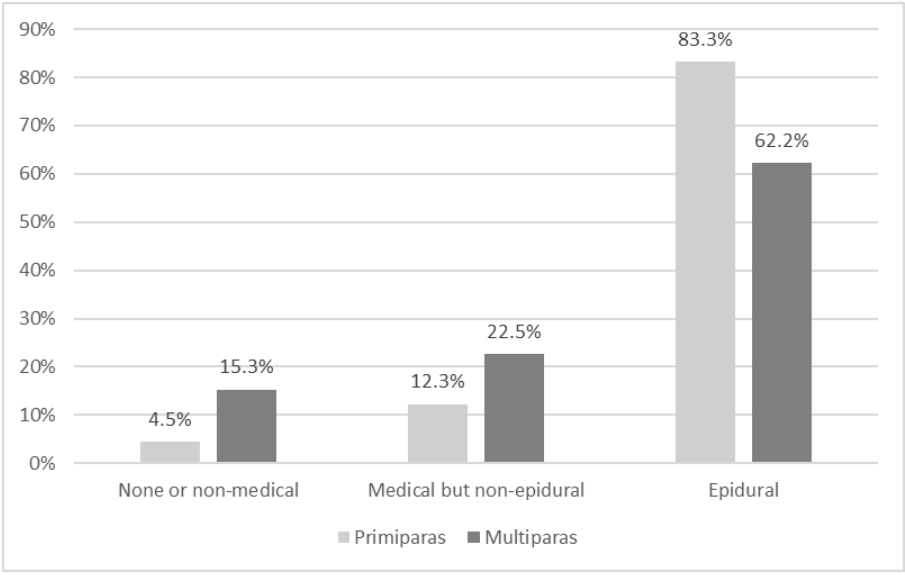

Figure 9 The percentages of pain relief used during labour and delivery separately for primiparas and multiparas

The results differed between primiparas and multiparas. Amongst primiparas, epidural and medical but non-epidural pain relief use did not have significant effects to the likelihood of a negative childbirth experience compared with those who used none or non-medical pain relief during labour. Both an epidural (aOR = 0.64, 95% CI 0.57–0.73) and medical pain relief methods reduced the odds (aOR = 0.90, 95% CI 0.00–0.00) of having a highly positive childbirth experience rather than a positive childbirth experience. Amongst multiparas, the use of an epidural pain relief reduces the likelihood (aOR = 0.70, 95% CI 0.57–0.87) of having a negative childbirth experience, whilst also reducing the likelihood (aOR = 0.90, 95% CI 0.84–0.97) of a highly positive childbirth experience. Medical but non-epidural pain relief methods did not associate with the likelihood (aOR = 1.06, 95% CI 0.86–1.31) of having a negative childbirth experience, but were associated with a lower likelihood (aOR = 0.80, 95% CI 0.74–0.86) of having a highly positive childbirth experience.

THE CHILDBIRTH EXPERIENCE AND THE INTERVAL TO A SUBSEQUENT BIRTH

We analysed data for 50 826 women delivering their first child, amongst whom 90.4% (n = 45 947) also assessed their childbirth experience using the

VAS measurement before discharge from the delivery unit (study IV). In total, 16 812 (36.6%) of these parturients also had their second childbirth in a HUS delivery unit during the follow-up period. The parturients were followed up until the end of December 2018 or until they delivered their second child. The length of follow-up for each parturient depended upon the time of their first delivery. The average follow-up time (2.7 years) did not differ between negative and positive first-childbirth experiences.

Amongst 45 947 primiparas, 90.5% (n = 41 587) reported the first childbirth experience as positive, whilst the remaining 4360 women experienced their first childbirth as negative. Parturients reporting a negative first childbirth experience were more often unmarried or not cohabitating with a partner, obese, over 33 years old, and had a diagnosed fear of childbirth (FOC). More often they also presented with pre-eclampsia or gestational diabetes. *In vitro* fertilisation (IVF) treatment had no significant effect in this analysis.

First, the Kaplan-Meier cumulative incidence of having a subsequent child was estimated for women with both negative and positive first childbirth experiences (Figure 10). The median interval between the first and second childbirth was 1.4 years longer for those with a negative first childbirth experience [5.29 (95% CI 4.86–5.97)] compared with those having a positive childbirth experience [3.90 (95% CI 3.84–3.97)].

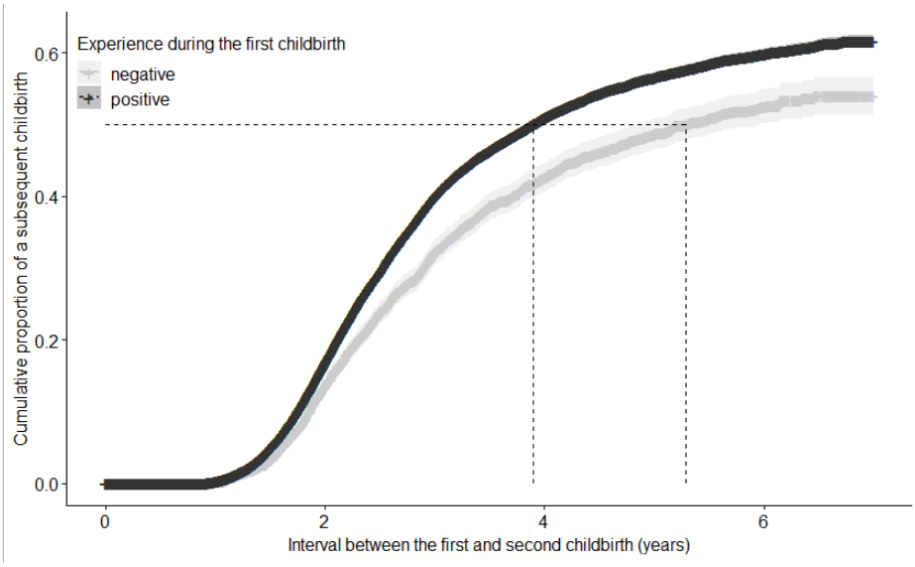

Figure 10 The cumulative incidence with 95% confidence intervals of a second childbirth after a positive or negative first childbirth experience. The median interval is indicated with the dotted line.

Second, we conducted a Cox regression analysis to compare the likelihood of a subsequent childbirth between groups with negative and positive first childbirth experiences. Potential confounding factors were included in the model and insignificant factors were discarded. The final model resulted in a lower likelihood of having a subsequent child [adjusted hazard ratio (aHR) = 0.81, 95% CI 0.76–0.86) for those with a negative first childbirth experience compared with a positive experience.

DISCUSSION AND CONCLUSIONS

We investigated factors related to and the consequences of the childbirth experience. Parity is a major factor explaining the childbirth experience and, thus, conducting separate analyses for primiparas and multiparas was justified. The mode of delivery also strongly affected the childbirth experience. Labour induction carries a small effect on the childbirth experience, but combined with the mode of delivery it has a major effect based on our results. The associations between pain relief methods and the childbirth experience were complex and, therefore, the results must be intepreted with caution.

FACTORS IMPACTING THE CHILDBIRTH EXPERIENCE

PARITY

Throughout these studies (studies I and II), parity associated with a major difference in the average childbirth experience. The overall difference between primiparas and multiparas exceeded 0.5 points on a 10-point VAS scale, and a negative childbirth experience (VAS = 1–5) was more common amongst primiparas (9.5%) than amongst multiparas (3.9%; study I). When only a successful vaginal delivery was considered, the difference between primiparas and multiparas was roughly 0.5 points and, respectively, a negative childbirth experience was more prevalent amongst primiparas (5.3%) than amongst multiparas (2.4%; study II). The magnitude of this difference is apparent when compared with the corresponding difference of 0.2 points for an induced onset of labour. This difference might partly emerge from unrealistic or negative expectations since more positive expectations were found to produce more positive experiences (Ayers & Pickering, 2005; Green et al., 1990; Hauck et al., 2007; Webb et al., 2021). Nevertheless, previous data indicate that a positive experience follows when the reality of childbirth mirrors expectations (Webb et al., 2021). Thus, women approaching their first childbirth should be well informed and prepared to have a positive but simultaneously realistic expectations related to labour and delivery.

LABOUR INDUCTION AND THE MODE OF DELIVERY

Labour induction associated with an impaired childbirth experience (study II) (Schaal et al., 2019) and a higher risk of a negative childbirth experience (Adler et al., 2020; Falk et al., 2019; Hildingsson et al., 2019; Waldenström, 2004). Additionally, we found that the impact of the mode of delivery on the childbirth experience was stronger than the effect of induction, since an induced vaginal delivery was perceived more positively than an assisted vaginal delivery with a spontaneous onset of labour. These results agree with most (Blomquist et al., 2011; Carquillat et al., 2016), but not all (Kempe & Vikström-Bolin, 2020; Spaich et al., 2013) studies. Moreover, our study confirmed the results from previous studies (Davey & King, 2016; Henderson & Redshaw, 2013; Jacquemyn et al., 2012; Pyykönen et al., 2018) showing that the risk of an operative delivery (including an instrumental vaginal delivery and both unplanned and planned caesarean sections) was higher for those with induced labour. In contrast, a Finnish study (Kruit et al., 2022) argued that the induction of labour does not associate with a higher risk for operative deliveries when common confounding factors (advanced maternal age, obesity, and gestational diabetes) are controlled. This conflicting result might result from the indications for an induction of labour and caesarean section, which could not be specified in our study.

LABOUR PAIN AND PAIN RELIEF

Our findings (study III) support the interpretation that the relationship between pain relief methods and the childbirth experience is complex (Camann, 2017). The availability, timing, and effectiveness of a specific pain relief method in relation to the course of labour contribute to the childbirth experience. In primiparas, the use of medical pain relief (including both epidural and non-epidural medical pain relief methods) reduced the likelihood of having a highly positive childbirth experience compared with a positive childbirth experience. Nevertheless, none of the medical pain relief methods impacted the likelihood of having a negative childbirth experience. Amongst multiparas, an epidural was related to a lower likelihood of having a negative as well as a highly positive childbirth experience compared with a positive experience. At the same time, medical pain relief was associated with a lower likelihood of having a highly positive experience.

Although intolerable pain is a risk factor for a negative childbirth experience (C. Larsson et al., 2011b; Nystedt & Hildingsson, 2014; Simpson & Catling, 2016), effective pain relief does not guarantee a positive childbirth experience (Camann, 2017). Neuraxial analgesia provides the most effective pain relief, but the highest satisfaction scores were reported for parturients who did not receive it (Camann, 2017). This indicates that expectations and values guide the options of parturients according to pain relief methods

received during labour. If these are aligned with the course of labour and pain remains tolerable, the likelihood of a positive childbirth experience is highest. By contrast, if the expectations and reality of childbirth conflict during labour, this more likely leads to a negative experience (Webb et al., 2021). Since we did not have data on the sequence of pain relief method use or events during labour, we based our results on the sum of events. The retrospective design of our study is highly prone to an effect of confounding by indication, since a more difficult delivery requires more efficient pain relief, which is also a risk factor for a more negative experience. Thus, these results confirm that pain management during labour should be flexible and adhere to the changing needs of the parturient.

Another perspective in the relationship between the childbirth experience and pain relief is the concept of natural childbirth as a better mode of delivery (Lupton, 2012; Símonardóttir & Rúdólfsdóttir, 2021). This expectation might impair the experience, particularly amongst primiparas who may be more vulnerable due to their lack of experience of, for instance, labour pain (Símonardóttir & Rúdólfsdóttir, 2021). Furthermore, diverging expectations and experiences may have a negative impact on the experiences of women (Webb et al., 2021). Although parturients may comprehend their expectation of a drug-free labour is unrealistic (Lally et al., 2008), this may attenuate a highly positive childbirth experience (Camann, 2017).

TIME OF DELIVERY

The time of delivery had a modest effect on the childbirth experience, which was analysed in study I. These slight changes were possibly derived from organisational changes. Specifically, major changes in HUS delivery hospitals were implemented in 2017 when Kätilöopisto Hospital was closed, and deliveries were concentrated in larger units at the Women's Hospital and Espoo Hospital. This change might potentially reflect the lower childbirth experience scores recorded after 2016. Furthermore, our more detailed results revealed that negative childbirth experiences were more common in larger delivery units compared with smaller units. The closure of Kätilöopisto was preceded by the discontinuation of physical birth preparation classes and excursion visits to the delivery hospital for parturients and their partners in 2015 and 2016. These were replaced with digital materials and, therefore, the opportunity to physically visit the hospital and meet with hospital staff was no longer possible. Participation in antenatal classes, however, has been associated with the childbirth experience (Goodman et al., 2004).

The Finnish delivery care system might have some shortcomings from the parturient's point of view. Shift changes expose parturients to several midwives and other professionals, potentially diminishing patient confidence

in professional support. Yet, professional support has been identified as an integral part of the childbirth experience (Dencker et al., 2010). Furthermore, continuous support has been associated with several desirable outcomes compared with other models (i.e., a higher proportion of vaginal births, less need for pain relief, shorter labour duration, and more satisfaction with the experience) (Bohren et al., 2017; Sandall et al., 2016). Recurrent failures in resourcing result in professional fatigue, and, thus, cumulative negative consequences extending to parturients as well. Since professionalism in childbirth requires extensive knowledge and expertise, fluctuations in experienced staff due to seasonal variations (i.e., holiday season) and the time of day (office hours versus non-office hours) might cause time-related changes in the quality of maternal care in hospital. However, we found no clear indications about the impact of these change.

OTHER FACTORS

An existing fear of childbirth (FOC) has emerged as a risk factor for a negative childbirth experience (see Table 2), and a previous negative childbirth experience has been associated with a later FOC (see Table 3). In our studies (studies I–III), FOC was considered a confounding factor in various analyses, since it was a primary variable of interest in this study. The effect was substantial and significant across all analyses. FOC might serve as a crucial mediator between a negative experience and subsequent births. However, in this study, we could not confirm this hypothesis since the register data included only those parturients who had a subsequent childbirth.

The length of labour was handled in a two-fold manner since the effect of prolonged labour was controlled for in study II and after controlling for quartiles during the first and second stages in study III. These revealed that a prolonged first phase of labour or a prolonged expulsion phase negatively impacted the childbirth experience. These results align with findings from previous studies (see Table 2). Moreover, oxytocin augmentation carries favourable medical outcomes, despite ultimately harming the childbirth experience (Selin et al., 2021). In our study (study III), we analysed the use of oxytocin since it has been associated with the use of epidural analgesia (Dencker et al., 2010; Walker et al., 2015). Our results agree with previous studies indicating that oxytocin significantly and negatively associates with the childbirth experience after controlling for other variables. Nevertheless, it is crucial to note that the use of oxytocin is justified by a factor possibly also influencing VAS.

CONSEQUENCES OF THE CHILDBIRTH EXPERIENCE

The maternal childbirth experience has many direct and indirect effects on the wellbeing of mothers and their families, but may also have many societal implications. Negative childbirth experiences might pose challenges that directly and/or indirectly affect the wellbeing of parents and might influence their subsequent family plans. These micro-level decisions regarding having a second child cumulate into macro-level consequences on population development.

We followed women after their first childbirth until a subsequent childbirth or until the end of the follow-up period in December 2018. The likelihood of having a second childbirth clearly associated with both negative and positive first childbirth experiences. Based on our results (study IV), one in five parturients reporting a negative experience during the first childbirth decided not to have a subsequent baby. A negative experience produced a 1.4-year longer interval between the first and second childbirths when compared with positive experiences. The delay in the attempt to have a second child is problematic in terms of fertility, since fertility declines as maternal age increases. To address this, we analysed age groups separately, but found no significant difference in the interval to a subsequent childbirth between age groups when maternal age was <40 years at the first childbirth. When we examined the interval until the second childbirth, we could not detect an impact on subsequent births, which might even extend the influence of a negative childbirth experience on subsequent childbirths.

Three possible consequences of a negative childbirth have been identified: not having a second child, deciding to delay a subsequent child, and a maternal request for a caesarean delivery during a subsequent delivery (Shorey et al., 2018). Two rather small Swedish studies have addressed the childbirth experience and future reproductive decisions previously using selected data (Gottvall & Waldenström, 2002; Klint Carlander et al., 2014). Findings from the earlier study agree with our results, while the latter study detected no association between a negative childbirth experience and the interval to a subsequent childbirth. Thus, our study was a novel attempt to address this association using a large cohort, which may serve as a potential benchmark for further studies.

CONTRIBUTIONS AND SUGGESTIONS FOR FUTURE RESEARCH

Table 5 summarises the primary findings from studies I–IV. Previous associations between various factors and the childbirth experience were

presented in more detail in the literature review. Whilst parity was not the primary variable of interest in our study, it appeared to significantly contribute to the childbirth experience. Timely differences to changes in the childbirth experience related to parity led us to conclude that childbirth preparation for primiparas might serve to actively manage more realistic and positive expectations amongst mothers-to-be and, thus, improve the childbirth experience. In future, childbirth preparation could be developed and its effectiveness evaluated.

In study I, the childbirth experience was associated with organisational changes. To confirm these conclusions, changes in the childbirth experience should be investigated in more detail considering different hospital units. The confounding effect of labour induction should be controlled for in order to clarify the impact of time of day on the childbirth experience.

Labour induction (study II) also associated with a more negative childbirth experience. It is crucial to examine the indications for labour induction and evaluate the medical rationale for these decisions. In particular, practices aimed at diminishing extra discomfort related to induced labour should be further investigated.

Table 5. *The contributions of this study to factors associated with the childbirth experience*

	Contribution of this study	**Suggestion for future research**
Parity	A negative childbirth experience was more common amongst primiparas (RR = 2.4) compared with multiparas, in agreement with previous studies.	Could preparationg for primiparas produce more realistic expectations of the childbirth experience, thereby improving the maternal experience?
Time of delivery	Organisational changes and changes in childbirth preparation practices associated with a more negative childbirth experience. Primiparas delivering at night and multiparas delivering in the evening reported a more negative childbirth experience.	The impact of centralising deliveries in larger units on the childbirth experience should be explored. The effect of labour induction should be eliminated to more clearly understand the association between the time of day and the childbirth experience.

Labour induction	Despite the mostly desirable clinical outcomes of labour induction identified in previous studies, parturients experiencing an induced labour had a more negative childbirth experience. They also had a higher risk for operative deliveries.	Does induction help to achieve its intended advantages (vis-à-vis the health and wellbeing of the mother and infant)? Are there any practices that reduce the discomfort related to labour induction when medical indications are clear?
Pain relief	The association with pain relief is complex and varies between parities. Epidural pain relief might help to avoid negative experiences whilst also reducing the possibility of having a highly positive experience.	Prenatal plans and values related to pain relief during labour should be considered to clarify the association between pain relief and the childbirth experience.
Subsequent birth	A clear and strong association exists between a negative childbirth experience and the interval to a subsequent delivery.	What are the most effective and cost-effective treatments to avoid long-term adverse consequences following a negative childbirth experience?

In future research related to the association between pain relief and the childbirth experience, it would be valuable to consider previous plans and values according to distinct pain relief methods. Values and expectations based on pain and pain relief might impact perceptions about successful labour and delivery and how the parturient evaluates her experience. Considering previous plans might help to better understand this complex relationship between pain, pain relief, and the childbirth experience.

In study IV, we demonstrated that a negative childbirth experience resulted in a longer subsequent pregnancy interval and a lower likelihood of having a second child. However, women with a negative childbirth experience can be treated in order to avoid any long-lasting adverse consequences. Diverse treatments for parturients should be examined in order to find the most cost-effective treatments likely to minimise the adverse consequences related to a negative experience.

THE CONCEPTUAL FRAMEWORK FOR A HOLISTIC CHILDBIRTH EXPERIENCE

We aimed to achieve a deeper understanding of the factors and consequensces of the childbirth experience. Based on previous research and our findings, we outlined the childbirth experience journey within the continuum of care (Figure 11). Touchpoints including various interactions with maternal health care and other parties during the prenatal and postnatal periods are depicted with green and blue ovals, whereby the green ovals are internal to the maternal healthcare system, whilst blue ovals represent external touchpoints. During prenatal touchpoints, women face several contacts during which childbirth expectations are formed (Ayers & Pickering, 2005; Green et al., 1990; Hauck et al., 2007). Some of these touchpoints lie within maternal healthcare services, including visits to maternal health clinics, ultrasound examinations, or outpatient visits to the delivery unit. Others include conversations with peers, relatives, and others as well as interactions via social or traditional media. Contacts might also occur with privately provided services, like birth education or doula services. Intranatal touchpoints include several crucial interactions during labour and delivery. Since the number and sequence of these touchpoints vary highly according to the course of labour, they are not depicted in Figure 11. However, those interactions with delivery hospital professionals and partner or other support persons may substantially strengthen or weaken the childbirth experience. In this illustration, intranatal touchpoints also include interactions during a stay in the postnatal unit, which typically lasts one or two days following delivery. These stays might affect the childbirth experience since VAS measurement takes place at the end of the hospital stay. Postnatal touchpoints consist of conversations with peers, relatives, and friends as well as interactions in maternity health clinics and social media. Additional support offered following a negative childbirth experience acts as an additional postnatal touchpoint and an attempt to manage the holistic childbirth experience.

The coherence of these touchpoints along the customer experience journey is important, since it appears to improve the experience (Jaakkola & Terho, 2021). The delivery hospital is an exception in the Finnish maternity care continuum, primarily driven by maternity and child health clinics, which might represent a threat to that coherence. Thus, cooperation between maternity health clinics and delivery hospitals should be seamless when managing positive childbirth experiences. Furthermore, the touchpoints external to the maternal healthcare system might strengthen or weaken patient confidence in the services provided by the maternity care system. The information and support required to prepare for the childbirth are currently primarily gathered from various touchpoints, which might provide controversial information and values. This poses challenges to maternal care

in hospitals if the expectations do not align with the reality, also shown to weaken the experience (Webb et al., 2021).

The childbirth experience is influenced by several delivery factors, only a few of which (identified in italics in Figure 11) we managed to examine here. Delivery factors are highly complex and associate with each other. Since our study was based on data from medical registries, we could not evaluate the experiental characteristics of childbirth. However, it is understood that the childbirth experience is multidimensional by nature. Experiental characteristics in the framework follow the dimensions previously identified (Dencker et al., 2010). These dimensions combined with delivery factors include cognitive, emotional, physical, social, and sensorial elements.

In our study cohort, the timing of VAS measurement was positioned before discharge from the postnatal unit, consistent with the current service system. For most parturients, this occurs less than 72 hours after delivery, possibly too soon to capture the holistic childbirth experience. Thus, currently it is not possible to capture the changes in childbirth experience using VAS following hospital discharge.

Furthermore, the multidimensional phenomenon of the childbirth experience can hardly be explicitly defined, although there are many useful attempts to capture the most essential components of it. Figure 11 illustrates the primary features of the childbirth experience as understood within this study. This figure exemplifies the conceptions of multidimensionality, subjectivity, expectations turning to experiences, and the formation of the experience along a continuum of time and various touchpoints.

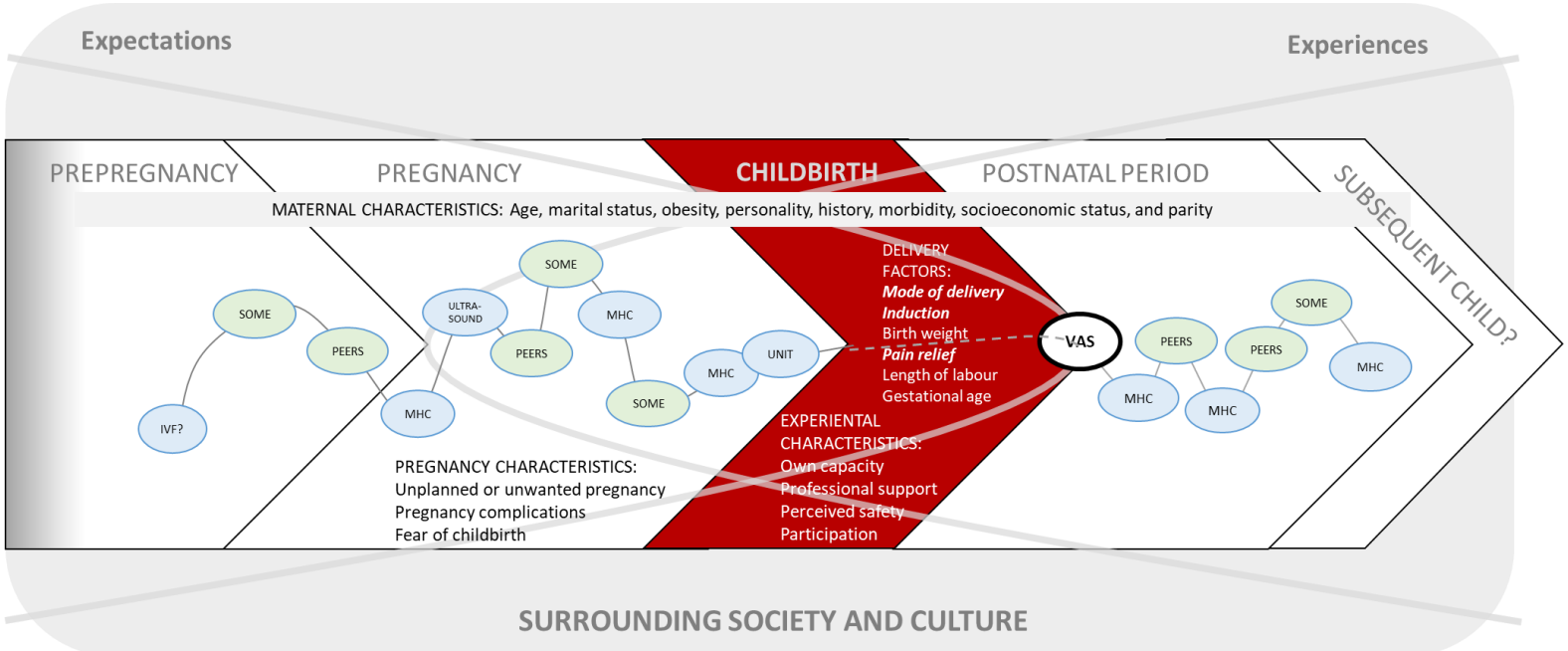

Figure 11 The formation of the childbirth experience as a subjective perception via several touchpoints, emerging from expectations and characteristics during the pregnancy, childbirth, and postnatal periods. The ovals represent touchpoints, of which MHC indicates an interaction with a maternity health clinic, UNIT indicates an outpatient visit to a delivery hospital, SOME indicates interactions with (social) media, whilst PEERS indicates informal interactions with peers, friends, and relatives.

Resulting from our findings, we developed a framework which depicts the relations investigated in this study (Figure 12). We combined the results of four different studies, showing that primiparity (studies I–III), operative deliveries (study II), and the induction of labour (study II) affected the childbirth experience negatively. Pain relief also influenced the childbirth experience, but it was complex and varied slightly between primiparas and multiparas (study III). Additionally, we demonstrated that the childbirth experience influences the interval and likelihood of having a subsequent child (study IV). This association was positive since the initial positive childbirth experience was more likely followed by another pregnancy and childbirth. Since we can only postulate the reason behind these reproductive decisions in families, we may also speculate which direct and indirect factors accompany this finding. However, previous studies have revealed associations between a negative childbirth experience and a secondary FOC (Dencker et al., 2019; Rouhe et al., 2009), which also emerged as a risk factor for a negative childbirth experience (Dencker et al., 2019; Nilsson et al., 2010; Størksen et al., 2013). In addition, several other adverse consequences to the mother and the entire family have been introduced (see Table 2). Considering these associations, the postnatal touchpoints of the childbirth experience are highly important. This holds especially after a negative childbirth experience in order to avoid the long-lasting adverse effects, which might result in avoiding or postponing a subsequent pregnancy or a maternal request for a caesarean section for a subsequent delivery (Shorey et al., 2018).

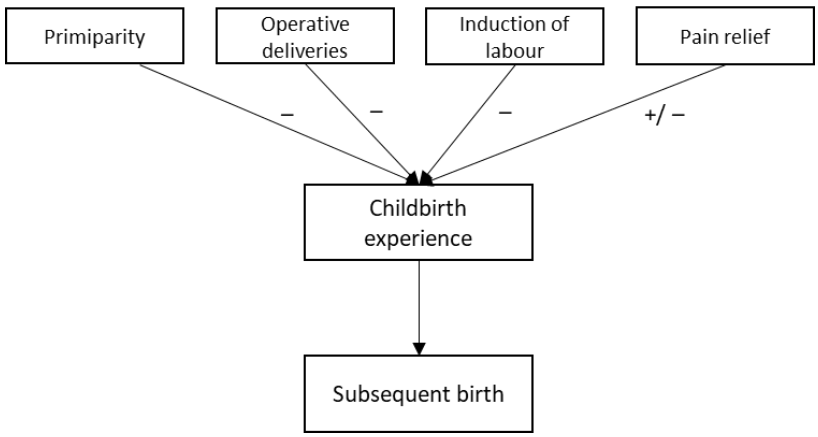

Figure 12 The framework of factors and consequences of the childbirth experience

STRENGTHS AND LIMITATIONS

Our study has several strengths. The comprehensive and reliable data cover the majority of eligible parturients in the HUS area, comprising one-third of all childbirths in Finland during 2012–2018. The routine collection of VAS minimises the risk of selection bias. In addition, the simplicity of the measurement likely accounts for the high response rate, since it attenuates any possible challenges due to the lack of a shared language between the caregiver and the parturient. Data from the accurate and mandatory Medical Birth Registry combined with the maternal childbirth experience provide reliable data to analyse the associations between the characteristics and consequences of the maternal childbirth experience (Langhoff-Roos et al., 2014).

That said, the primary limitation to this research is the simple ten-point VAS rating, which does not capture the multidimensional nature of childbirth. However, prior data show that VAS sufficiently measures the childbirth experience (Adler et al., 2020; Falk et al., 2019; Kempe & Vikström-Bolin, 2020; C. Larsson et al., 2011b; Turkmen et al., 2018), and correlates with more detailed measures of the childbirth experience (Larsson et al., 2011b; Place et al., 2022; Turkmen et al., 2018). The negative experience measured by VAS could not be itemised and, thus, further evaluation of the reasons for a negative rating is warranted. Routine VAS collection from most of the parturients is a practical screening tool and, thus, in HUS delivery hospitals parturients reporting a negative VAS are contacted several weeks following childbirth. This contact aims to detect parturients at risk for post-traumatic stress disorder, depression, or challenges in mother-infant bonding and to refer them for further treatment (Mäkelä et al., 2021). Routinely collected VAS can also be used for management-level actions by comparing the performance of units and providing feedback. Since data have been recorded in the register for the past decade, it can be used to detect the consequences of changes to delivery services based on the parturients' perspective.

In addition, the timing of the measurement of VAS is a limitation, since shortly (mostly <72 hours) after childbirth might not be the optimal time to measure the childbirth experience. It has been suggested that the relief of getting through delivery could mask the negative childbirth experience quickly after childbirth (Maimburg et al., 2016; Waldenström, 2004). However, there are also data that indicate a consistency to the childbirth experience over time (Bossano et al., 2017; Turkmen et al., 2018). By contrast, more than half of the parturients reported more negative experiences after just six weeks compared with the assessment during the first week following delivery (Lyngbye et al., 2022).

The lack of socioeconomic data could also represent a limitation. However, no studies addressing the socioeconomic status of parturients and the childbirth experience reveal any association in settings comparable to Finland (Lemmens et al., 2021; Slade et al., 1993). Thus, we may assume that the availability and affordability of public services dilute the influence of socioeconomic factors on the quality of service in Finnish maternity care.

Finally, all confounding factors could not be accounted for since this study is based on medical registers. Thus, the similarity across the groups compared based on specific factors could not necessarily be confirmed, which is typical in a cohort study. Additionally, we could only detect second childbirths situated in HUS delivery hospitals.

To conclude, the ten-point VAS scale is a valid measure for detecting changes in the childbirth experience according to parity, the induction of labour, the mode of delivery, and pain relief. This supports the view that medical interventions should be considered carefully from the childbirth experience point of view as well. Our results indicate that the childbirth experience carries substantial consequences on individuals, but also on society as a whole. A decrease in the birth rate due to negative childbirth experiences must be considered at all levels of society.

MANAGERIAL IMPLICATIONS OF THE CHILDBIRTH EXPERIENCE

Table 6 summarises suggestions for the potential use of VAS data to manage the childbirth experience for different levels of the Finnish maternal healthcare system. The framework developed by Gilmore and colleagues (Gilmore et al., 2023) on the purposes and applicability of the use of healthcare performance indicators on the micro-, meso-, and macro-levels was adopted to summarise the implications based on this study. Based on our results, three sets of implications can be identified to foster better childbirth experiences. Suggestions not drawn directly from the results of this study, but which emerge from knowledge about the subject, appear in grey text. However, further research is needed to understand the impact of the suggestions.

Table 6. *Potential uses of the findings from this study to improve the quality of care*

Level of management	Object of utilisation	Implications based on this study
Macro-level	Policy development System performance monitoring System quality assurance	An effective treatment path for parturients with a negative childbirth experience Another routine VAS screening during the postnatal check-up to identify parturients whose experiences have negatively shifted after the initial screening in a hospital
Meso-level	Regulation Organisational-level performance improvement Quality-based financing	An option to select a delivery unit should be preserved Factors that could improve the childbirth experience should be further developed and assessed Different ways to prepare for and orient parturients to the labour and delivery (including the variety of pain relief options) should be provided (e.g., digital visits to the hospital, preparation for both the parturient and her partner)

Micro-level	Improvement to the practice or team performance Improvement to individual performance Patient choice	Inductions without clear medical indications should be avoided Access to various pain relief methods should be continuous and flexible throughout labour and delivery Feedback for individual professionals about negative experiences might lead to professional growth

First, the micro-level potential to utilise data on the childbirth experience include the involvement of parturients in decisions related to care including the flexible availability and informed choices surrounding sufficient pain relief (study III). Additionally, in relation to the maternal childbirth experience, the benefits and risks of labour induction should be considered carefully (study II). A potential advantage on the micro-level use of the childbirth experience measurement might include feedback on a negative childbirth experience for individual professionals from the maternal viewpoint, which they can incorporate into their work and which provides an opportunity for professional development.

Second, meso-level practices emerge mostly from the results from study I, which revealed a temporal compatibility of changes to the childbirth experience and the healthcare system. The diminished availability of childbirth preparation and visits to a delivery hospital could potentially produce more negative experiences, especially among primiparas. New and effective ways to prepare for childbirth should be developed in order to foster positive childbirth experiences. Since negative experiences became more common in larger units, parturients should have an option to select their delivery hospital.

Third, our results do not pinpoint clear macro-level efforts to foster a positive childbirth experience. However, we detected an impact from negative childbirth experiences on longer intervals and a lower likelihood of having a subsequent birth. In this regard, we recommend ensuring an effective treatment path for parturients with a negative childbirth experience. Such treatment aims to restructure and integrate the experience into women's life stories and foster a feeling of safety. Moreover, effective treatment has been shown to decrease the adverse effects of a negative childbirth experience. This also reduces the FOC, which appears to pose a risk for a subsequent negative childbirth experience (Saisto, 2000; Mäkelä et al., 2021). Timing of the measurement is a crucial issue in the childbirth experience due to the transformative nature of the experience. Especially negative or traumatic experiences might take time to integrate into one's

mind (Waldenström, 2004) and, therefore, measuring the experience a few days after childbirth might bias the results. To override any possible measurement bias, we suggest conducting a second VAS measurement routinely during a postnatal visit (5–12 weeks after childbirth, see Figure 3). This second measurement point could identify parturients whose experiences have shifted negatively after the first screening in hospital. Those parturients should also be referred to treatment as described above. However, it should be acknowledged that this distance makes such measurements vulnerable to other issues that might reflect the childbirth experience.

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