Breastfeeding after a caesarean section: Mother-infant health trade-offs

KLINGAMAN, KRISTIN

Breastfeeding after a caesarean section: Mother-infant health trade-offs

by

Kristin Patricia Klingaman
Parent-Infant Sleep Laboratory and Medical Anthropology Research Group
Department of Anthropology, Durham University
September 2009

A thesis submitted in partial fulfilment of the requirements for the degree of
Doctor of Philosophy

Biological Anthropology

Program of study committee:
Helen Ball, Primary supervisor
Catherine Panter-Brick, Secondary supervisor
Wenda Trevathan, External examiner
Tessa Pollard, Internal examiner

Abstract

This thesis demonstrates the value of an anthropological perspective on informing appropriate breastfeeding support after caesarean section delivery. In contrast to epidemiological research that identifies distinct aspects of mother-infant interactions altered by this birth mode, my research explored the interrelated obstacles to breastfeeding from the mothers' perspectives as the experiences were unfolding. I apply Trivers's (1974) parent-offspring conflict model to conceptualise breastfeeding and predict realisation of infant feeding based on the interaction of maternal cost and infant benefit. The work adds the previously unstudied population of caesarean section-delivered breastfeeding dyads to the human life-history theory line of investigation.

Postnatal ward and telephone semi-structured interview data were collected in Newcastle, England during 2006-09 with two groups of women. Phase 1 comprised participants who underwent either an unscheduled or scheduled caesarean section delivery (n = 75). Phase 2 involved women who experienced scheduled, non-labour caesarean section delivery and were randomly allocated an intervention or control cot for the entirety of their postnatal ward stay (n = 51). The impact of the infant side-car crib or standalone cot on breastfeeding was tested among the Phase 2 mothers by comparison of 35 overnight postnatal ward video recordings.

The various aspects of women's delivery and infant care were prioritised based on their knowledge of known risks and benefits. Intentions were carried out within the context of the support and opportunities available. Contrary to popular belief, the decision to undergo a caesarean section and deviation from prenatal breastfeeding intentions were undertaken because they seemed like the best or only option in the circumstances. Many women felt frustrated because of their postnatal limitations with caretaking for infants who were described as unexpectedly doing poorly. The absence of labour before the caesarean section was perceived to be beneficial by the mothers due to the intense pain of contractions and the undo "stress" vaginal parturition posed for the infant. However, the participants were surprised by being told by midwives after the delivery that (sub-clinically) poor infant condition was a common consequence of caesarean section. Some breastfeeding difficulty stemmed from "mucous" expulsion that had to occur before the babies could be "interested" in feeding.

The peak mother-infant breastfeeding conflict was night-time after visiting hours. Midwifery and maternal concerns over the mothers' lack of sleep prompted formula supplementation. As predicted, the side-car crib was associated with reduction of the maternal cost of breastfeeding. However, participants in the intervention group were not observed breastfeeding significantly more frequently than the control group as expected. The cost-benefit breastfeeding model suggests that high maternal cost and/or low perceived infant benefit was experienced to such a degree that mothers breastfed minimally despite the "huge difference" in infant access afforded by the side-car crib compared to the standalone cot. Regardless, data support the side-car crib as the better arrangement for mother-infant dyads who underwent a non-labour caesarean section due to the less potential infant risk observed and the benefit to maternal recovery.

The utility of the parent-offspring conflict framework for predicting breastfeeding outcomes was supported by the association of reported reasons for breastfeeding intent and of bedsharing with breastfeeding frequency and duration. The thesis suggests that more detailed physiological information may enable families to better understand public health advice for exclusive breastfeeding and low caesarean section delivery rates. Breastfeeding after a caesarean section is affected by interrelated and compounding difficulties, so my

single alteration in the postnatal environment did not resolve the impediments. An evolutionary perspective can assist in identifying populations at risk for suboptimal health outcomes and designing support to ameliorate mismatches between coevolved processes and routinely encountered conditions.

Contents

Declarations

I declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material which to a substantial extent has been accepted for the award of any other degree or diploma of the university or other institute of higher learning, except where due acknowledgment has been made in the text.

Acknowledgements
Thank you Professor Helen Ball for being extraordinary among the outstanding teachers I have had. I would also like to recognise Professor Jim McKenna for his inspiration and continuous support.

My utmost gratitude is for the study participants. Without their willingness, time and thoughtfulness this research would not exist. I also appreciate the assistance of Doctor Martin Ward-Platt, Helen Gray and other key staff at the Royal Victoria Infirmary. Additionally, thank you Steve Leech for helping me with technical issues in the Sleep Lab on numerous occasions.

Thank you to the Rotary Foundation, Overseas Research Student Award Scheme, British Federation of Women Graduates, Durham Anthropology, Ustinov College, Parkes Foundation, Owen F. Aldis Scholarship Fund, BioSocial Society and the other funding bodies that enabled me to carry out this work.

Jon, thank you for supporting me in so many ways. To my family, thank you for everything. I dedicate the thesis to my mom.

Conferences
I presented draft ideas and results of this work at the following:

"Application of Trivers's (1974) parent-offspring conflict model to breastfeeding" (Poster) Society for the Study of Human Biology Proffered Papers Meeting, Durham, England on 17 September 2009

"Breastfeeding following caesarean section delivery: An anthropological perspective to understanding the early postpartum consequences" (Paper) Society for Reproductive and Infant Psychology 29th Annual Conference, Newcastle-upon-Tyne, England, on 10 September 2009

"Evolutionary theory applied to breastfeeding on the postnatal ward" (Poster) Durham University Annual Anthropology Postgraduate Conference, Durham, England on 29 April 2009

"An evolutionary perspective on breastfeeding after non-labour caesarean section delivery" (Paper) International Society for Human Ethology 19th Biennial Conference, Bologna, Italy on 15 July 2008

"Why labour matters: The impact of parturition mechanisms on the foetal transition to extrauterine life" (Paper) Durham University Annual Anthropology Postgraduate Conference, Durham, England on 8 May 2008

"Maternal sleep and tiredness after scheduled caesarean section delivery" (Invited Poster) American Association of Physical Anthropology 77th Annual Conference, Columbus, Ohio on 13 April 2008

"Factors leading to the decision to undergo caesarean section delivery and the ideology underlying them" (Paper) American Anthropological Association 106th Annual Conference, Washington D.C. on 1 December 2007

"Anthropology of breastfeeding" (Poster) Durham University 175th Anniversary Celebration, Queen's Campus, Stockton-on-Tees, England on 8 September 2007

"Postnatal ward breastfeeding after vaginal or caesarean section delivery" (Poster) Nutrition and Nurture in Infancy and Childhood: Bio-cultural Perspectives Conference, Grange-over-Sands, England on 25 June 2007

"Breastfeeding after caesarean section delivery" (Invited Paper) Developmental Physiology Conference, Leicester, England on 21 June 2007

"Maternal satisfaction on the postnatal ward after caesarean section delivery" (Paper) Monitoring Parents: Childrearing in the Age of Intensive Parenting Conference, Canterbury, England on 21 May 2007

"Ethics of a breastfeeding intervention trial" (Paper) Durham University Annual Anthropology Postgraduate Conference, Durham, England on 20 April 2007

"Breastfeeding initiation after unscheduled and scheduled caesarean section delivery" (Poster) Society for the Study of Human Biology Evolution and Medicine Symposium, York, England on 11 December 2006

"Infant care after caesarean section delivery: Methodology" (Paper) Durham University Annual Anthropology Postgraduate Conference, Durham, England on 24 April 2006

Publications

In addition to abstracts from the above-listed conferences, this work is discussed in:

Klingaman, K.P. & Ball, H.L. 2009 (March). Practicing evolutionary medicine in a postnatal ward: Ameliorating iatrogenic obstacles to breastfeeding. *Anthropology News*, 9-11.

Ball, H.L., & Klingaman, K.P. 2007. Breastfeeding and mother-infant sleep proximity: Implications for infant care. In Trevanthan, W.R., Smith, E.O., and McKenna , J.J., (Eds.). *Evolutionary medicine and health: New perspectives* (226-241). Oxford: Oxford University Press.

Klingaman, K.P. & Ball, H.L. 2007. Anthropology of birth and breastfeeding: Rationale for evolutionary medicine on the postnatal ward. *Durham Anthropology Journal*, 14(1).

Word count

The thesis is approximately 87,000 words. This includes footnotes but excludes tables, graphs, references and appendices.

PAGE

Images

Tables

Graphs

Figures

Preface

I first became aware of Biological Anthropology as a freshman at the University of Notre Dame. My course of study quickly changed from the business school after orientation by an anthropologist known as much for tap-dancing in class as his research. I was fortunate to find Professor McKenna early in my studies. I participated in all of his courses available because the cross-disciplinary nature of anthropology was appealing to me for understanding complexities of human health.

I pursued undergraduate study in anthropology alongside economics. Until recently, I perceived the dual majors as comprising separate sets of knowledge and tools. My background in economics became valuable as a graduate student studying life history theory, which is referred to as 'evolutionary economics' by Vitzthum (2008a; 2008b). I recognised the connection of the concept of scarcity as central to many forms of resource allocation, including infant care strategies. We have limited time and/or energy to devote to conflicting pursuits, so we prioritise based on the known costs and benefits.

Breastfeeding is a multi-faceted interaction between mothers, infants and those important to them. There are many influences to infant feeding outcomes; attitudes, environment, behaviour and physiology interrelate. There is no single intervention to better support breastfeeding dyads, but a variable that consistently emerges as vital is maternal commitment (Avery et al., 2009; Pérez-Ríos, Ramos-Valencia and Ortiz, 2008). Postnatal investment in human infants is variable because the costs and benefits are great and women have the capacity for facultative responses (Ball and Panter-Brick, 2001). For example, mothers are hormonally primed to breastfeed but they are not physically required to do so. Providing nutrition for offspring entails frequent feeding and therefore maintenance of proximity and, thanks to our expanded neocortex, we have the ability to foresee the corresponding opportunity costs.

I approach the topic of breastfeeding after a caesarean section with the viewpoint of childbirth and infant feeding as products of evolution and being interrelated. Caesarean section delivery is a mode of birth that I value, but perceive as disrupting 'normal' processes because it is novel in the context of the human species. Sometimes obstetric and parenting practices are adopted because they seem best, but the cultural uniqueness and deviation from evolutionarily 'normal' experiences is unrecognised (Trevathan and McKenna, 1994).

The Baby Friendly Hospital Initiative (BFHI) is countering entrenched obstetric practices like mother-newborn separation and scheduled infant feeding to promote a 'breastfeeding culture' (WHO/UNICEF, 1990; 2009). I hope to contribute to the knowledge upon which the decisions are made and environments that enable intentions to be realised. I see failure to support infants and their families to the fullest extent possible as diminishing us as societies.[1]

In choosing this topic, I am asserting that it is an issue worth investigating. This is from a scientific stance of the impact of breast milk and lactation on health and from the desire to meaningfully contribute to families' well-being.

[1] The health of infants has long been used as an indicator of the general well-being of a society (Bennet and Kotelchuck, 1997).

Chapter 1: Introduction

This thesis applies evolutionary theory to public health. It is my hope that this investigation supplements clinical knowledge and public awareness, thereby leading to more informed and satisfying health related decisions.

A novel breastfeeding and lactation context

Caesarean section delivery presents a practical barrier to general mother-newborn interactions due to maternal-infant physical complications, limited maternal mobility and persistent postpartum maternal pain (Chertok, 2006; Declercq et al., 2008). The epidemiological research that has addressed infant feeding after a caesarean section implicitly presents the conundrum as an example of life-history trade-offs. Pérez-Ríos, Ramos-Valencia and Ortiz (2008) state that the amalgam of "aggravated health outcomes can compromise the mother's ability to breastfeed" while also "forcing mothers to concentrate more on their recovery, rather than on their baby's [sic] nutritional needs" (p. 294). This statement is testament to both the importance of investigating this topic and the opportunity for incorporation of anthropological theory into clinical science.

In addition to practical challenges, caesarean section delivery is associated with some detrimental physiological effects on breastfeeding/lactation. Chapter 2 discusses that these problems arise from the different hormonal milieu and medication compared to spontaneous onset labour and unmedicated parturition. I also address how the postpartum behavioural capabilities are initially limited in both mothers and infants (specifying when possible the association with unscheduled and/or scheduled caesarean section).[1] I situate breastfeeding after a caesarean section within the anthropological perspective that cultural changes and technological advances frequently outpace our biological adaptations. Changes to human life, such as experienced through obstetrical tools, have been rapidly applied when viewed in the timeframe of the existence of our species. This can lead to 'unexpected' circumstances and therefore evolutionarily novel challenges because our biological makeup is adapted to past conditions.

Alternatives to the human breast were not widely available before the advent of infant formulas in the mid-twentieth century as a last resort to combat the high mortality among orphans (Stuart-Macadam, 1995). Infant feeding options are increasingly being improved as research identifies the properties of breast milk,[2] but formula feeding remains biologically suboptimal (Gartner et al., 2005). In areas in which health care is available and accessible, water is sanitary and families are able to afford the cost of purchasing infant formula, the risks of not breastfeeding are still great – although not widely acknowledged.

Breastfeeding is the main source of infant immunity (Labbock, Clark, and Goldman, 2004). Provision of breast milk is considered an effective preventive measure for reducing child mortality. The impact of improved exclusive breastfeeding rates to six months of age, with continued breastfeeding for at least a year is estimated as a 13% reduction in global child deaths (Jones et al., 2003). Chen and Rogan (2004) calculated odds ratios for the risk of child death in the United States post-neonatal period in relation to breastfeeding duration.

[1] Throughout the thesis I refer to 'emergency' caesarean section delivery as 'unscheduled' and 'elective' as 'scheduled.' The justification is presented in Chapter 5. Scheduled caesarean section represents non-labour delivery, although pages 69 and 95 show that booking an appointment for a caesarean section is sometimes followed by spontaneous onset of labour and subsequently an unscheduled caesarean. In addition to my research, I refer to the findings of other studies with this 'unscheduled' and 'scheduled' terminology.

[2] Picciano (2001) offers a review of the known nutrients in human milk. The protective functions of other specific constituents in human breast milk are detailed by Hamosh (2001) and Hanson (2004).

Overall, children who were ever breastfed had 0.79 (95% CI: 0.67-0.93) times the risk of never breastfed children for dying in the post-neonatal period (n = 9,953 in total). The researchers acknowledge that breastfeeding effects cannot be entirely separated from other health influences, but the studies referenced below suggest that formula feeding undermines[1] specific aspects of child and maternal health.

Breastfeeding confers protection to infants against infectious diseases (Duijts, Ramadhani, and Moll, 2009). Colostrum coats the newborn intestine with a specific microbial flora that lessens the susceptibility to infections and allergic disease (Di Renzo and Simeoni, 2006). Infants who receive breast milk are also associated with fewer parental reports of infant colic behaviour, constipation, vomiting and thrush than formula fed infants (Bolling et al., 2007). Gartner and colleagues (2005) summarised evidence that suggests breast milk reduces the risk of bacterial meningitis, bacteremia (bacteria in the blood), diarrhoea, respiratory tract infection, necrotizing enterocolitis (a gastrointestinal disease), otitis media (ear infection) and urinary tract infection. A New Zealand study powered to detect respiratory outcomes of children at 15 months of age found that (after adjustment for confounders) each month of exclusive breastfeeding reduced the risk of doctor-diagnosed asthma by 20% (95% CI: 0.71-0.90), wheezing by 12% (95% CI: 0.82-0.94) and inhaler use by 14% (95% CI: 0.78-0.93) (Silvers et al., 2009).

The World Health Organization (WHO) systematic review by Horta and colleagues (2007) suggests that being formula fed increases the long-term risk of high systolic and diastolic blood pressure, high adulthood serum cholesterol, overweight/obesity and type 2 diabetes. The report also concluded that current evidence supports the positive association of breast milk and higher performance in intelligence tests in late adolescence or young adulthood.[2] Rates of sudden infant death syndrome, lymphoma, leukaemia and Hodgkin are greater among those who received only formula (Gartner et al., 2005). Overall, lack of breast milk provision is associated with more severe child illness and slower recovery (Bolling et al., 2007). Chertok and Shoham-Vardi (2008) found that among 468 term infants who experienced caesarean section delivery, those who were not breastfed had a greater likelihood of hospital re-admission compared to those who were breastfed.

In addition to infant health, lack of breastfeeding is associated with more frequent use and higher cost of health care for the offspring (Cattaneo et al., 2006). The costs of infant feeding also extend to parental absenteeism from employment due to child illness and the environmental production of human milk substitute products and disposal of the formula containers (Gartner et al., 2005).

Lactation is associated with health benefits for the mother, in addition to the closeness and gratification that can be conferred through breastfeeding. In the early postpartum period, the hormone oxytocin that is stimulated in the mother as a response to infant suckling promotes uterine involution (Blackburn, 2007; Wasaka et al., 2009). The resumption of fecundity varies for parturient women, but frequent infant suckling alters the levels of luteinizing and follicle stimulating hormones. This suppresses ovulation and is known as lactational amenorrhea.[3] Maternal weight loss can be facilitated by breastfeeding through

[1] Breast milk and lactation are physiological norms for human infants and mothers. Berry and Gribble (2008) caution that conceptualisation of breastfeeding as optimal may distract from appreciation of the detrimental health consequences of formula feeding.

[2] The presence of long-chain polyunsaturated fatty acids in breast milk but not in formula could contribute to difference in brain development (Reynolds, 2001; Heird, 2001).

[3] In addition to the hormonal profiles affected by frequent breastfeeding, the resumption of menstruation and ovulation are affected by maternal energy levels (Valeggia and Ellison, 2009).

utilisation of maternal tissue stores.[1] Additionally, not lactating is associated with increased risk of pre-menopausal breast cancer, ovarian cancer, type 2 diabetes, hypertension and cardiovascular disease (Stuebe and Schwarz, 2009). Kramer and Kakuma (2001) cite studies that have found greater risk of osteoporosis in women who have not breastfed.[2]

Evolutionary framework

I conceptualise breastfeeding after a caesarean section as impacting the above-mentioned health outcomes and people's more general well-being. This 'salutogenic' approach portrays health as a positive concept (Antonovsky, 1979, in Downe and McCourt, 2004). The interrelated 'web' of everyday interactions is increasingly the focus of public health policy (WHO, 2007; Panter-Brick and Fuentes, 2008). There are specific calls for anthropological study to inform health promotion (Deschamps, 2008), so that programmes "can reflect the complex reality [of biosocial health determinants] rather than mask it" (Green, 2006: 406). Various anthropologists and medical doctors suggest that an evolutionary framework can be effectively applied to clinical research and subsequently to policy.[3] They cite the value of the conceptual lens of humans as a species and the synthesis of data from various disciplines, such physiology and epidemiology.

Evolutionary or 'Darwinian' medicine incorporates the selection processes and resulting traits into understandings about health and disease (Ellison and Jasienska, 2008). An appreciation of the environments to which mammals, primates and hominins adapted enables a more accurate view of the range of 'normalcy' in modern biology and behaviour. Evolutionary medicine, in particular evolutionary obstetrics and paediatrics, is directly applicable to public health because the framework predicts that vulnerability to suboptimal health outcomes arise from incongruities between our legacy and current experiences. Mother-infant health trade-offs with breastfeeding after caesarean section delivery are a previously unresearched topic in the field of evolutionary medicine, although Trevathan (1987) pointed out its importance (p. 139 and p. 234).

Biological anthropology provides a unique starting point to explore and formulate testable predictions with infant feeding post-caesarean section because the science contributes an appreciation of coevolved maternal-newborn biology. Additionally, evolutionary theory posits that mother-offspring interaction inherently involves both harmonious and discordant interests (Trivers, 1974). Reproduction has been a particular area of focus in life history theory, since pregnancy and lactation are particularly costly for human females. These concepts are detailed in Chapter 2.

Childbirth and infant feeding decisions are often sensitive, personal issues. An evolutionary perspective on health and medicine does not suggest blanket adoption of behaviours to coincide with Pleistocene experiences, as Hausman (2003) describes as occurring with breastfeeding promotion (p. 124). Instead, anthropological inquiry expands the viewpoint within which the appropriateness of decisions can be weighed. I was surprised when attending a conference, Monitoring Parents: Childrearing in the Age of Intensive Parenting, when the theme that emerged from the organisers was that "breastfeeding matters, but not with a capital M" (E. Lee, personal communication, May

[1] However, the greatest factor associated with postpartum maternal weight retention is the amount of weight added during gestation (Walker, Sterling, and Timmerman, 2005; Lyu et al., 2009).

[2] See Alderman and colleagues (1986), Melton and colleagues (1993) and Cummings and Klineberg (1993). The lack of clinical consensus regarding the effect of lactation on mothers' bone density is hypothesised by Labbok (2001) to be a reflection of the lack of substantial breastfeeding variability in studied populations, absence of cross-species comparisons, the expense of research conduct and lack of control for maternal socioeconomic characteristics.

[3] See Eaton and colleagues (2002), Smith (2007), Trevathan, Smith and McKenna (2008) and Ball (2008).

2007). Given the overwhelming evidence of the health effects of breast milk/lactation, it seemed that some researchers were trivialising the importance of infant feeding substances/methods. What I now appreciate is that mothers' immediate needs can conflict with breastfeeding and so interventions may be most beneficial when breastfeeding is enabled by making the investment easier for mothers…not just providing them with information about how biologically important it is to achieve certain outcomes. Hausman (2003) similarly recommends "maternal agency" as a focus for infant feeding discussions and support (p. 28). Circumstances should provide families with the opportunity for various infant caretaking strategies, but downplaying the health trade-offs may hinder pressure for institutional and/or cultural change.

Research objectives and study design

Maternal breastfeeding experiences and semi-structured interviews

The first objective of my research was to investigate the factors that mothers report as influencing breastfeeding after a caesarean section. I designed semi-structured questions to address a specific range of topics that had previously been researched with women who underwent caesarean section delivery in Britain (Churchill, Savage, and Francome, 2006). Although I anticipated that some difficulties with breastfeeding would be attributed to the delivery mode, I purposefully did not frame it as an expected issue.

I documented maternal perspectives of postnatal ward and home breastfeeding as the experiences were occurring. These data provide insight into the women's feelings about breastfeeding, the barriers they cited as most affecting realisation of the process and the ways in which they thought support could be improved.

The value of women's thoughts about their deliveries is discussed by Carolan (2006) as insight into the experiences that are important to them. She asserts that these data are useful for 'woman-centred'[1] care because midwives and other health professionals can subsequently provide more meaningful support. Although Carolan supports 'story-based' evidence, I agree that women's perceptions of their experience, when ascertained and analysed in a rigorous way, offer valuable contributions to clinical and anthropological literature.

I also felt it important to explore maternal reasoning for the decision to undergo a caesarean section delivery. This secondary data can contribute to understanding, and therefore possible future intervention, into how families arrive in this context.

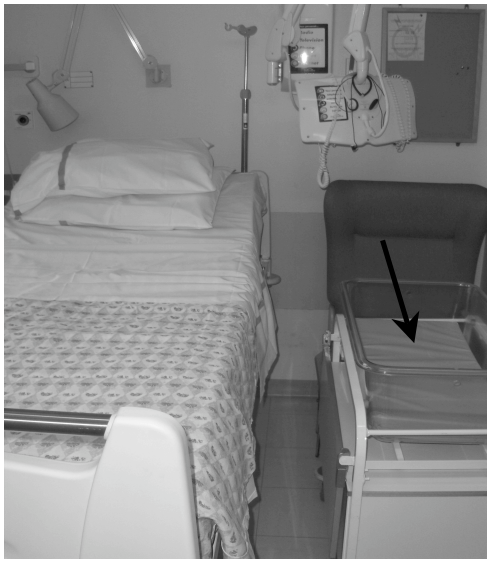
Randomised breastfeeding intervention and filming

My second principal objective was to test whether provision of the infant side-car crib would facilitate postnatal ward breastfeeding after caesarean section delivery compared to having the standalone cot. I anticipated the side-car crib as being a relatively easy modification to hospital routines and therefore having potential for widespread adoption. Image 1.1 shows the standalone cot and Image 1.2 is the side-car crib intervention.[2]

[1] Leap (2009) reflects on the implications of adopting 'woman-centred' instead of 'women-centred' care. She suggests that the former is optimal for midwifery, as it acknowledges the individuality of mothers and of the support appropriate.

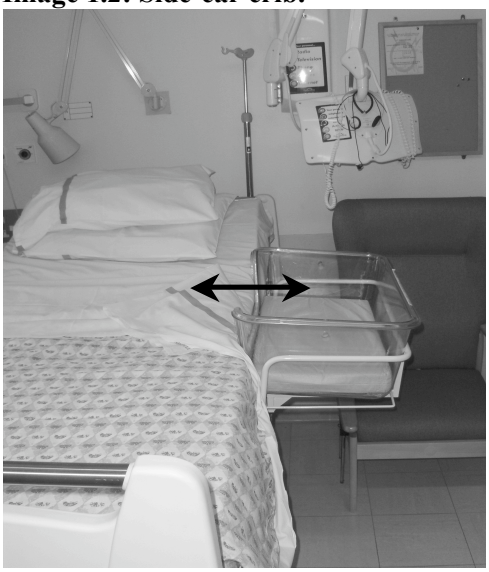
[2] I took these photographs on the study location – Ward 32 of the Royal Victoria Infirmary in Newcastle, England.

Image 1.1: Standalone cot.



Control cot, adjacent to bed.

Image 1.2: Side-car crib.

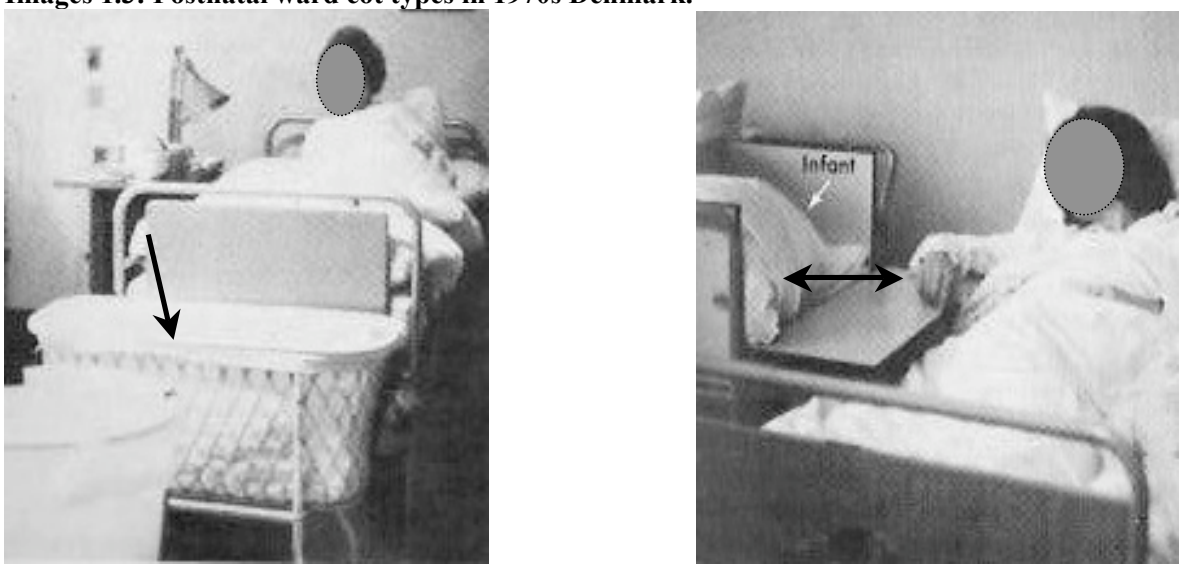


Intervention cot, attached to bed.

The standalone cot comprises a clear acrylic bassinet in a metal frame on a four-wheeled cart. This is normally the only cot type used at the study hospital and most other British postnatal wards. The side-car crib is three-sided and locks onto the frame of the maternity bed. It has two metal latches that fit over the side frame of the bed and a flat metal clamp that positions underneath the mattress. The side-car crib provides a continuous surface to the bed, but the acrylic edges of the crib near to where it attaches to the bed curve around at both sides.

The idea and implementation of the different rooming-in scenarios are not new. In a seminal work on mother-newborn interactions, Klaus and Kennel (1976) discussed the benefits of enhanced physical and visual access provided by a three-sided infant cot directly next to the mother compared to a more distant and isolating infant location in the mother's postnatal ward room (Images 1.3).

Images 1.3: Postnatal ward cot types in 1970s Denmark.[1]



Despite suggestion of the importance of the postnatal ward infant location decades ago, the standalone cot is still the standard arrangement.

[1] I added the anonymisation and the arrows indicate the infant location: Klaus and Kennel (1976: 91).

I adopted the controlled study design to allow for measurement of the independent variable (cot type) on the specified dependent variable (breastfeeding frequency). A randomised controlled trial (RCT) was selected because if participants were permitted to choose their cot type, the effects of the arrangement on breastfeeding could not be separated from participant characteristics. RCTs are the 'gold standard' in clinical research because random participant assignment to the control or intervention leads to high probability that observed differences are due to the 'treatment' (Bryman, 2008). If I had undertaken a non-randomised observational study, I would have been able to investigate the means by which the cot types affected breastfeeding but could not have attributed the differences to the standalone cot or side-car crib.

Valid maternity care research is particularly difficult to achieve because of the interrelated influences that affect breastfeeding intention and practice (Downe and McCourt, 2004). Random allocation strove to ensure that the factors that might affect outcome measures, known and unknown, were balanced in the two groups. When study samples are statistically identical at the outset, then these baseline characteristics can be inferred as not contributing to a difference in the predetermined outcome measure between the groups (Jadad and Enkin, 2007).

There can be a gap between what people do and what they say happened, so observational data is a crucial component for investigating human behaviour (Silverman, 2004). In addition to acquiring a level of understanding of participants' infant care strategies after a caesarean via verbal descriptions, I documented their actions. In discussing her rationale for observing mothers and their infants over the first postpartum hour, Trevathan (1987) points to the immense contribution to anthropological literature provided by Margaret Mead's (1956) direct observations of childbirth on a Pacific island. Trevathan explains that although witnessing such proceedings does not guarantee an accurate description, the observation enables fuller and more meaningful description of complex maternity issues (p. 38).

Participant statements in response to questioning is also limited to remembrance, so video recording on the postnatal ward enabled an objective, quantifiable comparison of mother-infant behaviour to reliably compare the impact of the cot types on breastfeeding. Additionally, the video provided a more general insight into the previously unknown series of maternal actions and emotions after a scheduled caesarean section. Observational data captured individual as well as common actions, which is important because behaviour is "not a static thing to be discovered" (Banks, 2001: 112). The use of this technology is espoused by Murthy (2008) as providing visible accounts for both analyses and communication in presentations.

A secondary objective was to analyse the infant safety with side-car crib use compared to the standalone cot. The impact of a postnatal ward arrangement on breastfeeding is of little value if it imposes risk of harm.

Thesis organisation

The thesis is organised into chapters that detail various aspects of maternal perspectives of self and infant care after caesarean section delivery. I view breastfeeding as both reflecting and contributing to other maternity factors. This perspective is consistent with the approach outlined by Downe and McCourt (2004). In exploring breastfeeding influences, I did not anticipate a straightforward cause-effect relationship. Rather, the context – the relevant areas connected with breastfeeding – was my area of interest. Researchers increasingly position health related behaviours as a network of connections (see Panter-Brick and Fuentes, 2008) because in Downe and McCourt's words: "while the overall

pattern may be predictable, the interacting elements and process that produce this outcome are not" (2004: 14).

Chapter 2 justifies an evolutionary approach to investigating breastfeeding after a caesarean section and presents what is known on the topic in the fields of epidemiology, physiology and anthropology. Literature detailing breastfeeding intent, caesarean section decision-making, breastfeeding initiation and factors affecting breastfeeding duration are analysed in the discussion sections of Chapters 4 to 8 in relation to how my findings contribute.

Chapter 3 presents the design, protocol and conduct of the two-phase research. I conducted semi-structured interviews on the postnatal ward with mothers after caesarean section delivery (Phases 1 and 2), filmed mother-infant dyads in their postnatal ward room on their second night after a scheduled caesarean section (Phase 2) and documented home breastfeeding with periodic semi-structured telephone interviews (Phases 1 and 2).

Where appropriate, I present qualitative data from both phases alongside the quantitative summaries and/or images from the video observation. Triangulated data are useful to address multiple angles of a certain point (Voils et al., 2008). For example, results include how maternal discomfort was described as inhibiting breastfeeding, women's rating of their level of postpartum pain and an image to illustrate their manoeuvring experiences.

Chapter 4 provides study details and participant demographics. The section also reports the reasons that women gave for their intended infant feeding method. Perception of infant and/or maternal benefits to breastfeeding is a potentially important contributor of women's commitment to infant feeding plans.

Chapter 5 reports the participants' explanations for undergoing the caesarean section. The chapter includes accounts of delivery experiences to provide greater insight into the birth mode decision-making process. If rates of caesarean section delivery were not so high, then the impact on breastfeeding would not be such a prominent concern. Conceptualisation of the caesarean section overall, and in relation to pain, suggest that participants did not feel as though they were taking the 'easier' delivery route. Instead, the decision seemed best or just necessary with the knowledge and support available.

Chapter 6 is the main section on maternal experiences with breastfeeding after a caesarean section. I lay out the various obstacles to breastfeeding – maternal and infant derived – that compound each other. I did not set out to analyse midwifery care; however, maternal statements and observation data suggested that some midwifery advice undermined breastfeeding. These events are presented in Chapter 6 in relation to factors that influenced deviation from breastfeeding exclusivity.

The trial results are provided in Chapter 7, including intention-to-treat (cot type allocated) and on-treatment (cot type primarily used as the infant sleep location) analyses. I include the characteristics of participant sleep because, for example, the proportion of time mothers were awake impacts upon interpretation of the breastfeeding results. Chapter 7 concludes with a summary of infant safety, women's reviews of their cot type and the factors that they reported as influencing their satisfaction with the observed postnatal ward night.

Chapter 8 describes participants' breastfeeding over their first six postpartum months after caesarean section delivery. In addition to the duration of exclusive and any breastfeeding, I report the various coping strategies women adopted to ease their persistent tiredness.

The final chapter reviews the degree to which I met my research objectives, acknowledges the limitations of the findings and includes my research and policy suggestions.

The unifying theme of the data was women doing the best that they could to balance conflicts, given their particular circumstances and the information available to them.

Summary

Research into breastfeeding after a caesarean section is important because of the profound health consequences of breast milk/lactation and for women's experiences with infant caretaking.

The principal objectives of this research study were: (1) to investigate the factors that mothers report as influencing breastfeeding on the postnatal ward after a caesarean section delivery and (2) to test the efficacy of the side-car crib on increasing postnatal ward breastfeeding frequency compared to the standalone cot after a scheduled caesarean section delivery.

The secondary objectives were: (1) to explore maternal reasoning for the decision to undergo a caesarean section delivery; (2) to analyse the safety of the side-car crib compared to the standalone cot on the postnatal ward when randomly allocated to mothers after a scheduled caesarean section delivery; and (3) to investigate the factors that mothers report as influencing breastfeeding at home over the six months after a caesarean section delivery.

Chapter 2: Literature Review

I present breastfeeding/lactation as an evolved component of human life and explain how life history theory may be useful for predicting maternal breastfeeding investment. I then review the literature on caesarean section delivery and breastfeeding outcomes and identify how the present study aimed to contribute to understanding this relationship.

Lactation is a mammalian characteristic

Motherhood has required the input of female time and energy throughout mammalian, primate and hominin existence because of the physiological interconnectedness with their offspring. Delivery of bodily fluid to young from the mammae is one of the defining characteristics of mammals[1] (Lawrence and Lawrence, 2005), although reptiles, birds, amphibians and fish secrete substances to protectively coat their eggs (Clutton-Brock, 1991). Authors hypothesise about the origins of lactation (Oftedal, 2002a and 2002b; Vorbach, Capecchi, and Penninger, 2006), but it is generally accepted that the production of species-specific milk dates back around 200 million years (Martin, 2007).

The direct physiological investment by the mother continues until the moment of complete offspring weaning (Valeggia and Ellison, 2001). Lactation has been referred to as the final stage of labour (Labbok, 2001) and its termination is the physiological completion of the reproductive cycle. The availability of breast milk has, until relatively recently, been necessary for the survival of human infants (Wolf, 2003). Despite improvements in the composition of formula, the substance is biologically suboptimal in the vast majority of current circumstances (WHO, 2009a). The American Academy of Pediatrics confirms that all infant feeding substitutes differ "markedly" from the species-specific human breast milk (2005: 496).

The legacy of breastfeeding/lactation is important because knowledge of the environments to which organisms are suited provides a foundation for understanding their physical processes and behavioural repertoire. Human genetic change occurs over many generations, so we are said to 'expect' to encounter a certain range of conditions that have prevailed for millions of years. The most recent formative 'environments of evolutionary adaptedness' (Bowlby, 1969)[2] for human ancestors were characterised by unreliable food sources obtained through foraging and hunting. The Pleistocene environments[3] in southern and eastern Africa were open and xeric with dispersed resources (Aiello and Key, 2002; Benyshek and Watson, 2006). The likely periodic shortfalls in a mother's food supply would have largely failed to affect her breastfed infant because milk production can utilise maternal adipose tissue. This infant feeding method is evolutionarily beneficial in these conditions instead of 'regurgitation' of food for infants as it is foraged (Dall and Boyd, 2004). In addition to the ability of the mother to store fat reserves, lactation is theorised to have coevolved with gestational length, developmental status of newborns, the rate of infant growth and maintenance of mother-infant proximity (Prentice and Prentice, 1995; Pond, 1977).

---

[1] Linnaeus opted to distinguish the Class as Mammalia instead of Pilosa, which refers to another universal trait of mammals – hair – in part for breastfeeding promotion (Schiebinger, 1993 in Martin, 2007).

[2] Hrdy (1999) recounts that Bowlby borrowed from Hartmann's 1939 concept of 'man's ordinary expectable environment.' Currently, other terminology includes 'adaptively relevant environment' (Fuentes, 2009). What all of these phrases connote are the contexts in which an organism is suited to live and raise offspring who in turn reproduce. Humans are said to be adapted to the 'stone-age' but with many currently living 'space-age' lifestyles (Nesse and Williams, 1994: 134).

[3] The Pleistocene is the epoch from about 2.5 million years ago (mya) to 10,000 years ago (which marked the start of the Holocene). The members of the genus *Homo* spent the majority of their evolutionary trajectory in the Pleistocene (Fuentes, 2009).

The thousands of extant mammalian species (Wilson and Reeder, 2005) are testimony to the effectiveness of the Class's unique adaptation. Considering that breastfeeding is a defining characteristic of us as mammals and primates, this is the normative infant feeding model against which all alternatives are measured with regard to short- and long-term outcomes (Gartner et al., 2005). The World Health Organization recommends that babies be exclusively breastfed for the first six months of life (Butte, Lopez-Alarcon, and Garza, 2002), with continued breastfeeding for two years or longer (Horta et al., 2007). Breastfeeding uniquely meets various nutritional, developmental, and health needs of infants and young children. It is a dynamic process that provides individually tailored nutrients, immune factors, and physical contact to support normal growth and development (Walker, 2006; Jelliffe and Jelliffe, 1978).

Breastfeeding was vital throughout the majority of human existence, but no more than 35 percent of babies worldwide are currently exclusively breastfed during the first 4 months of life (WHO, 2003: 5). Most infants in developed countries are formula fed within the first months of birth and in many developing countries exclusive breastfeeding is rare (Renfrew and Hall, 2008).

The energy cost of human lactation is estimated to be 26% above the female non-reproductive (maintenance) state (Durfour and Sauther, 2002). The greater toll, however, is the extensive caretaking necessitated by the high degree of infant neurological immaturity.

Human infant neurological immaturity at birth

Humans, like all primates, are classified as a biologically 'continuous contact' species (Ben Shaul, 1962). This category of animals exhibits milk composition and infant feeding behaviour very differently than species whose developmental state and parental care differ. Human milk is easily digested and the low-solute concentration of fat and protein[1] means that infant gastric emptying is relatively quick (Van Den Driessche et al., 1999, in Walker, 2006). This necessitates frequent feeding and therefore close mother-child proximity.

Human infants' need for pronounced caregiving appears due to their degree of neurological immaturity at birth. The length of our gestation is a result of a balance between limiting infant dimensions so that they can fit through the birth canal and delaying delivery until offspring are capable of surviving outside the womb (Trevathan, 1987). The human neonatal brain comprises only 25% of its adult volume in contrast to the $\geq$ 45% present in non-human primate infants (Martin, 2007). Although debate exists regarding the exactness of these figures due to methodological issues (Vinicius, 2005), human infants are more dependent on their caregivers than those of other primates. In fact, *Homo sapiens* babies are the most immature of all mammalian newborns except for marsupials (Lawrence and Lawrence, 2005). Other mammals are born with 50% of their adult brain volume (Jurmain et al., 2008) and most singleton offspring have more than 75% (Lancaster, 1993).

Human infants largely follow the 'precocial' pattern of mammalian developmental trajectories. The reproduction of precocial species is typified by long gestation, singleton delivery, newborns with hair and the infants' eyes and ears open. The offspring can locomote soon after delivery or cling to the caregiver. In contrast, 'altricial' species are more fast breeding, born virtually hairless and with their eyes and ears sealed by membranes (Johnson and Everitt, 2000; Ball, 2008). The offspring are initially helpless and remain in nests in the rare instances in which they are left alone. So where do humans

[1] Blackburn (2007) reports that breast milk is primarily composed of water (87%), carbohydrates, fats, proteins, vitamins and minerals. The average energy is 75kcal/dL. Colostrum is lower in carbohydrates, fat and calories but very high in immunoglobulins. Formula can be retained in the infant stomach up to twice as long as breast milk because of formula's higher calorific density (Omari and Rudolph, 2004, in Blackburn, 2007).

fit on the precocial-altricial scale? Although primates have the lengthy pregnancies, hair, open eyes and ears of precocial mammals, humans are immobile and unable to cling (Hrdy, 1999). Portmann (1941) therefore described humans as 'secondarily altricial' (in Martin, 2007). This phrase refers to derivation of altricial traits from ancestrally precocial characteristics. Hrdy (1999) summarises the extreme dependency of *Homo* infants in stating, "to lose touch was death" (p. 97) because "essentially the mother was the baby's niche" (p. 98).

Our development at birth is less than expected compared to other primates due to constraints imposed by habitual bipedalism and significant encephalisation.

Habitual bipedalism

The archeological evidence suggests that the shift from quadrupedal locomotion to obligate bipedalism altered the entire skeletal structure of our ancestors, marking the rise of the taxonomical human family, Homininae (Trevathan, 2007).[1] The adaptations for bipedal locomotion that occurred approximately five million years ago included changes in the shape and rigidity of pelvis (Rosenberg and Trevathan, 2002), in addition to the other selective forces that affect pelvic morphology.[2] To support the internal organs (and foetus) against the weight of gravity the pelvis became more gynecoid from the anthropoid pelvis of quadrupedal primates.

The flattened, narrower pelvis is due to kinetic constraints for balanced, efficient locomotion.[3] Gynecoid type ilia are broader, the sacrum is wider and broader, the symphysis pubic is inclined, and so is the lumbro-sacral angle. Additionally, ischial spines are more anteriorly located and prominent. Data indicating that variations from the gynecoid structure or the corresponding muscle adaptations are associated with organ prolapse support their adaptive role in bipedalism (Schimpf and Tulikangas, 2005). Rosenberg's (1992) review of medical literature regarding rickets, breech presentation, and foetal-pelvic disproportion supports the assertion that selective forces act on obstetrics.

Encephalisation

The high degree of brain expansion in relation to body size began with the origin of the *Homo* genus, about 2 million years ago. The increase in brain volume was driven by the larger neocortex,[4] which permitted more complex analysis and behaviour. The threshold at which Martin (2007) estimated that the extensive brain growth would have first occurred postnatally was an adult cranial capacity of 850 cubic centimetres (cc). This volume is first evident in *Homo erectus*; the KNM-WT 15000 specimen has an approximately 900 cc brain case and dates back 1.6 million years (Kreger, 2008).

DeSilva and Lesnik (2008) apply their finding that adult brain mass explains 97% of the variance in neonatal brain mass to estimate that neonatal cranial capacity in early *Homo* was about 225 cc and reached approximately 280 cc in *Homo erectus*. Trevathan (2007) uses the postcranial fossil record to estimate that the pelvic canals of *Homo habilis*, *erectus* and *sapiens* all allow for passage of an approximately 350 cc neonatal cranium. Comparison with estimated adult brain size of the fossil hominids suggests that the species'

[1] The fossil evidence for the anatomical changes include: Sts 14, left hip bone and part of the right, 2.5 million years old; A.L. 288-1 (Lucy), sacrum and left hip bone about 3 million years old; and KNM-WT 15000, youth male pelvis, 1.6 million years old.

[2] Rosenberg (1992) cites a range of references that indicate locomotion, posture, visceral support and climate affect the pelvis structure. Other skeletal changes that occurred due to the shift to habitual bipedalism include changes with the foramen magnum, spine, femur and foot (Jurmain et al., 2008).

[3] See Schimpf and Tulikangas (2005) for a review the pelvic skeletal and muscular changes.

[4] The neocortex accounts for approximately 80% of the human brain volume (Dunbar, 1998, in Jurmain et al., 2008).

newborns had approximately 50%, 33% and 25% of their respective adult brain volume at birth.

The human infant's brain size is 50% larger than Great Apes' at birth relative to body size. Additionally, the brain growth of our newborns continues at the foetal trajectory, a rapid rate like that of altricial species, for a year postpartum. This is in contrast to the marked postnatal reduction in brain growth, relative to other body tissues,[1] seen in precocial mammals (Martin, 1983, in Martin, 2007). Vinicius (2005) asserts that human infants undergo a relatively slow body growth instead of rapid brain growth in relation to other primates. This distinction does not impact the relatively undeveloped neurological state of human neonates or the advanced degree of brain expansion that occurs postnatally in humans.

Parturition

Human infants are born before their 'foetal' brain growth is completed,[2] but there is no evidence that pregnancy would continue beyond nine months if pelvic morphology would allow. Encephalisation effectively shortened the gestational length but there is no indication that it absolutely did so. We have an average length of gestation relative to other primates. The approximately forty weeks is neither longer nor shorter than expected by maternal body size (Martin, 2007) and is similar to the thirty-two weeks of chimpanzees and thirty-seven weeks for gorillas (Rosenberg and Trevathan, 2002). The gestational length of orangutan, chimpanzee, and gorilla is not tied to their pelvic dimensions (Rosenberg, 1992). So, it does not appear that our newborn altriciality arises from a shortened gestational development due to constraints on the foetal braincase (and shoulders) passing through the birth canal; rather, it is the byproduct of our crania having so much more yet to grow.

Monkeys also have relatively large neonatal heads in relation to the maternal pelvis, but large bodied primates do not face the same birth challenge as humans. The widest parts of the *Homo* birth canal vary along its length, which means that hominin foetuses have to undergo a series of rotations[3] to allow their heads (slightly malleable at the front) and shoulders (rigid) to pass through the birth canal (Trevathan 1987; 1997; 1999; 2007). Alterations to the basin-shaped gynecoid pelvis would impact the efficiency cost of habitual bipedalism (Stanford, 2003).[4] If women had broader hips to allow for a wider foetal passage, then we would rock side-to-side when walking.

Rosenberg and Trevathan (2003) note that the presence of attendants at childbirth is almost universal across cultures and suggests that the size and shape of the birth canal encouraged the initiation of midwifery millions of years ago. *Homo* mothers are unable to reach down and assist their infants during delivery because they would pull against the newborns' flexion. Therefore, Rosenberg and Trevathan propose the theory that the "triple-challenge" of large-brained infants, a pelvis adapted for habitual bipedalism[5] and a backward

[1] Jurmain and colleagues (2008) point out that the infant brain grows faster than other body tissues except for the eyeball (p. 428).

[2] Infancy has been framed as a period of external gestation (Montagu, 1986; Portmann, 1941, in Martin, 2007; Bostock, 1962, in Jelliffe and Jelliffee, 1978; Gould, 1977, in Trevathan, 1987). What this means is that birth is a point on the continuum of human development and the infant initially continues to function as a foetus when outside of the womb.

[3] The origin of rotational parturition in human ancestors is debated in the literature. See Weaver and Hublin (2009) and Franciscus (2009).

[4] Stanford cites Taylor and Rowntree (1973), Strudel (1994), Leonard and Robertson (1997) and Rodman and McHenry (1980).

[5] Pelvic typologies do vary in humans (intermediaries of gynecoid, android, anthropoid and platypelloid) and so birth mechanisms are not entirely the same among women (Walrath, 2003). However, anthropologists recognise this continuum of pelvic typologies and base discussions on the most common resulting infant presentation at delivery, the occiput-anterior (front of baby's head faces back of maternal pelvis) position (Trevathan, 2003).

emergence pattern to the mother's pubic symphysis led to the rare mammalian trait of seeking of companionship for labour and delivery (2003: 85). They assert that although it is possible to deliver unaccompanied, it would have been beneficial for women to have physical and emotional support because of the impact on health outcomes and easing pregnant women's concern for the impending parturition difficulty. Trevathan (1987) further supports selective pressure favouring companionship in human birth by citing the complicated support required for positive outcomes in breech delivery.

Any trait that increases fitness would have been selected for over *Homo* evolution. The minimisation of locomotor cost would have been favoured as long as parental care adapted to meet infant needs. The risks imposed on mothers and their offspring during childbirth would have occurred relatively infrequently compared to the mechanical costs of a more accommodating female pelvis (Ellison, 2001). The benefit of the high degree of human postnatal brain growth is the ability to calibrate to the environment through physiological adjustments and learning (Jurmain et al., 2008: 428).[1] The unique life history stage of childhood in humans is a consequence of this lengthy postnatal human brain growth and results in prolonged dependency during offspring maturation (Bogin, 1999). The drawback is that maternal commitment to offspring investment has been documented as being more contingent on circumstances in comparison with other primates (Hrdy, 1999).

Life history theory

Within the paradigm of evolutionary medicine, research explores organisms' physiological calibration to predicted environments[2] and the flexibility in human behaviour. In this context I investigate maternal investment in breastfeeding because trade-offs[3] exist with how mothers allocate their finite time and energy. Whether consciously or not, prioritisation occurs based on the predicted costs and benefits of the different allocation between growth, maintenance and reproductive effort[4] (Bentley, 2007).

Parent-offspring conflict

Haig (1993; 2008) builds on Trivers's (1974) view that discordant interests are inherent between parents and offspring, with offspring selected to acquire more parental resources than is in the parents' best interest to provide. This physiological and behavioural 'tug of war' is due to the infant striving to be as healthy as possible without draining the caregiver to a degree that she/he can no longer invest – while the parental strategy is to produce healthy offspring (that lives to reproduce) at the minimal cost. Vitzthum (2008a) explains that it is in a female's best interest to balance resources among previous, current and future offspring to ensure their survival to reproductive maturity. The conflict is theorised to be ultimately due to sexual reproduction because a child's genes are 50% different than those of either parent.

The observation that genetic relatedness does not guarantee parental investment has led to a mathematical formula to predict investment outcomes. Hamilton's Rule (Hamilton, 1964) comprises three key variables: degree of relatedness between the donor and recipient (r); benefit of investment to the recipient (B); and cost of the resources to the donor (C). With

[1] Neurological research suggests both the prenatal and postnatal conditions influence gene expression (Uddin et al., 2008). DeSilva and Lesnik (2008) argue that natural selection favoured both absolute brain size and the amount of brain growth that occurs postnatally. Larger adult brains take a longer time to structurally and functionally mature at the cellular and then behavioural level (Barrickman et al., 2008).

[2] For example, see Núñez-de la Mora and Bentley (2008), Pollard and Unwin (2008), Baker and colleagues (2008) and Kuzawa (2008).

[3] Trade-offs may span physiological, psychological and social aspects of life.

[4] Reproductive effort is divided into direct and indirect forms by Reiches and colleagues (2009). They classify direct investment as mating behaviour, gestation/lactation and parenting whereas indirect investment is involvement in the production of offspring other than one's own.

this model, investment is evolutionarily worthwhile if rB > C. The prediction is that animals, including humans, will preferentially invest in close relatives, individuals with perceived high potential for future reproduction and those who incur relatively low costs (Strassman and Mace, 2008).

Evolutionary theorists have framed aspects of women's reproductive experience previously regarded as pathological, such as nausea during pregnancy (Profet, 1992) and miscarriage (Haig, 1993; Vitzthum, 2008a) as energetically protective for the mother. This perspective views morning sickness as a defensive mechanism against maternal ingestion of teratogens that could harm the developing embryo and early pregnancy loss as a screening tool for termination of chromosomally abnormal conceptions. When lactation is viewed in this broader context, life history theory is a useful framework for predicting the balance between maternal self-investment and care for her infant.

Even in conditions of plenty, humans face opportunity costs in the sometimes conflicting domains of growth, maintenance and reproductive investment (Bogin, Silva and Rios, 2007). For example, like many aspects of offspring investment,[1] the frequency and duration of breastfeeding is conditional to circumstances, women's experience and parenting preferences. This facultative response has been analysed in relation to infant feeding by various anthropologists, including Scheper-Hughes (1992), McDade and Worthman (1998), Ball and Panter-Brick (2001), Worthman and Kuzara (2005) and Sellen (2007). Lactation entails a considerable energetic burden over an extended period of time, which limits the maternal resources that can be directed towards other pursuits. If human pregnancy or lactation does not result in a healthy child or impedes the health of the mother or her other offspring, then it is biologically more beneficial to the mother to limit current costs of lactation and conserve herself for future fertility (Ellison, 2003).

Application to breastfeeding

It is generally in mothers' interest to breastfeed because of the profound health consequences for both their babies and themselves (refer to pp. 1-3). However, infant feeding strategies are embedded within cultural expectations, impact other aspects of families' lives and potentially impact the fecundity of mothers. Instead of a 'fixed action' behaviour, parturient women are physiologically primed to breastfeed and then to invest at different levels. Life history theory therefore predicts less maternal investment when costs of infant care are high or the benefit of the input is low. This differential reproductive effort has been documented as varying among humans according to their circumstances (Ellison, 2001). Bereczkei (2001) suggests that human parental psychology has been shaped to make adaptive decisions about the amount of offspring investment based on both infant cues and the maternal condition. He found that 590 Hungarian first-time mothers breastfed 'high-risk' low birth-weight children for a shorter duration than those born heavier, which he attributed to their perceived higher reproductive value. Bereczkei also found that the mothers had differential subsequent birth intervals depending on whether the perceived 'survival value' of the first infant, with a developmentally handicapped baby leading to the earlier arrival of a sibling. He attributes this finding to a low-investment, high quantity reproductive pattern.

[1] In addition to the energetic requirements of human offspring from their mother, the infants have need for close proximity for protection and physiological regulation. Our babies are vulnerable to predation because of their immobility and the fact that they cry and defecate when separated from their caregivers. This is in contrast to 'truly' altricial species who are adapted to behave in ways that make them undetectable in their mothers' absence (McKenna and McDade, 2005; Ball, 2008). Studies of human skin-to-skin contact and research with monkey infants demonstrate the detrimental developmental changes induced by separation. For example, see Harlow (1958), Klaus and Kennel (1976), Fardig (1980), Gray, Watt, and Blass (1999), Blum (2002), Anderson and colleagues (2003), Ruiz-Peláez, Charpak and Cuervo (2004), Moore, Anderson and Bergman (2007) and Hake-Brooks and Anderson (2008).

Mothers have vested interests in their own physical well-being and social status, so breastfeeding becomes a part of their lives to varying degrees, if at all. Mothers have the option of expending a portion of their finite time and effort towards breastfeeding, or they can draw upon alternative pathways for infant care such as wet-nurses, human milk substitutes or lack of engagement.

The maternal 'instinct' to raise few children and invest heavily in each is a specific historical construction. In the face of high infant mortality or other critical variables, infant attachment may be initially withheld. This seemingly contradictory maternal behaviour towards her offspring serves to protect women's emotional and physical engagement with their infants. Reiches and colleagues (2009) discuss that among human females, it is adaptive to preferentially care for offspring because the minimum level of investment required to gestate and lactate is considerable. They summarise the 'energy budget' and human life history theoretical perspective:

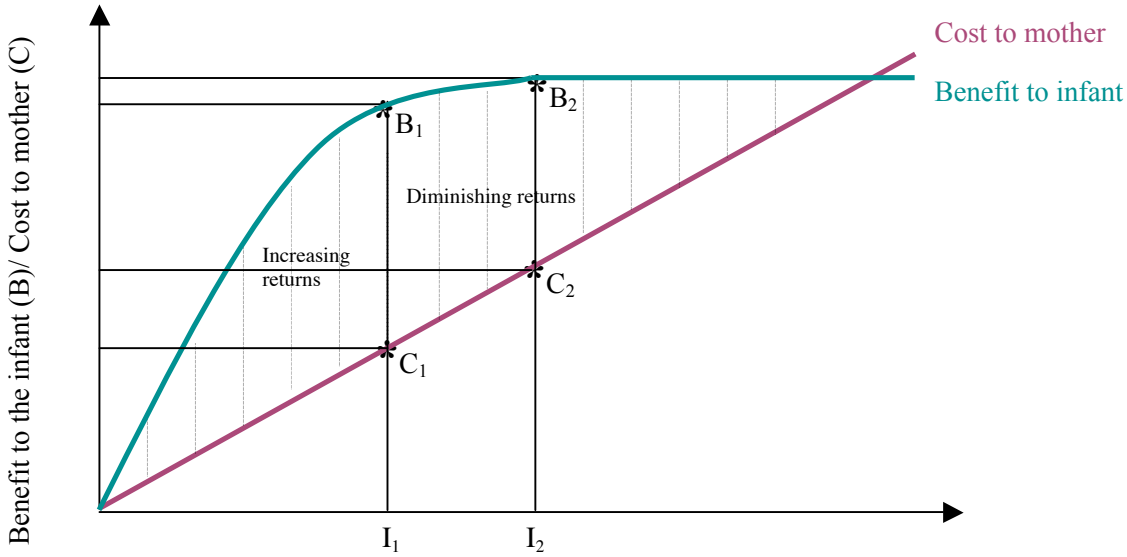
> It is adaptive to commit to these expenditures only when prospects for success are reasonable and only to a degree that optimizes lifetime reproductive success (p. 442).

Graph 2.1 expands the parent-offspring conflict model put forth by Trivers (1974) to illustrate the theoretical conflict between mothers and infants over the amount of breastfeeding. This model also adds to Hamilton's Rule in that it illustrates the benefit and cost at different levels of investment while holding relatedness, r, constant. It illustrates that the degree to which B > C determines investment at a certain point because of the benefit and cost increments from previous levels. The trade-offs are based on the economic concepts of rational decision-making and the principle of diminishing marginal returns (Sloman and Wride, 2009).[1]

The various levels of investment (time and effort) that a mother could devote to breastfeeding a particular infant are portrayed on the X-axis. The benefits to the infant and the costs to the mother of the various levels of investment are depicted by the Y-axis. The variables in this model are defined by the mother's perspective of the benefit and cost in addition to the physical impact. This differs from Trivers because he specified that his model represented the cost of parental investment in terms of ability to produce future offspring only. Graph 2.1 illustrates the marginal cost and benefit of certain breastfeeding frequencies (obtained through levels of maternal investment). The main point is that, *ceteris paribus*,[2] the optimum investment is at I_1 for the mother but it is at the greater level of I_2 for the infant.

[1] Graph 2.1 is an example of health economics, which deals with individual behaviour using the instruments of microeconomic theory to predict optimal allocation of resources (Zweifel, Breyer, and Kifman, 2009).
[2] The model assumes that the trade-offs remain as shown over the different levels of maternal investment.

Graph 2.1: Theoretical mother-infant health trade-offs with breastfeeding at a certain point in time, expanded from Trivers (1974: 252-253).



The complete absence of maternal investment results in zero benefit to the infant because the model assumes that the effort results in breastfeeding, which is advantageous for the infant. The slopes of the lines would vary according to the circumstances of each mother-infant dyad. I have illustrated maternal cost as linear (consistent with Trivers, 1974), but acknowledge that the shape of both lines can be debated. However, for all applications there is theoretically a peak in the benefit to infant, shown in Graph 2.1 at B_2. Past this point he/she would not breastfeed any more if given the opportunity. Although not shown in Graph 2.1, the benefit to the infant would eventually curve back down if maternal costs reached levels in which they induced maternal depletion, which would eventually detrimentally affect the infant's condition. For all women, there is theoretically a maximum 'profit' where the difference between benefit to the infant and the cost to herself is greatest. This point is labeled I_1 on Graph 2.1.

Trivers explains that infants (of any species) are best aware of their needs so selection should "favour parental attentiveness to signals from its offspring that apprize [sic] the parent of the offspring's condition" (1974: 257). However, the model predicts that the mother will subconsciously resist investment beyond I_1 because the additional time and effort incurs a greater cost to herself ($C_2 - C_1$) with only modest additional benefit to her infant ($B_2 - B_1$). This tendency is due to (subjective) utility maximisation in the face of uncertain outcomes, which is conceptualised in economics as the foundation of rational behaviour (Salehnejad, 2007).

Jasienska (2009) asserts that lactation and childcare are neglected domains in the investigation of reproduction costs. Much of the biomedical literature and public health policy is 'infant-centric' in that breastfeeding guidelines ignore the potential deleterious effects of prolonged lactation on maternal health in developing countries (Tracer, 2002). Tracer found that maternal energy reserves, measured in subcutaneous fat, decline with each pregnancy and lactation among women in Papua New Guinea. She calls for infant feeding guidelines to acknowledge the cost (in addition to the benefits) born by mothers. Trivers also cited concern for "imperfect replenishment of parental resources" that could translate into depletion over the long term (1974: 254).

The flexibility of parental investment creates potential for suboptimal infant care. This is exemplified by mismatches between the recommendations for exclusive breastfeeding and actual feeding practices in many contemporary populations (Sellen, 2007). Mothers have the capability for a range of engagement with lactation, but their behaviour needs to correspond with physiological processes to produce and maintain adequate breast milk. Impeded maternal capabilities predict breastfeeding initiation difficulties after a caesarean section, which has implications for long-term success.

The risks of caesarean section do not currently include breastfeeding disruption, despite the extensive debate over the trade-offs in relation to vaginal delivery (Kalish, McCullough, and Chervenak, 2008; Ecker and Frigoletto, 2007). Although public health guidelines recommend that caesarean section deliveries be restricted to those for whom the operation is medically indicated, the perceived trade-offs of the decision may be distorted among families and/or health professionals because of the usually favourable clinical outcomes. The complications after a caesarean section are generally not life-threatening in industrialised settings (Davis-Floyd, 2004), so postpartum physical and physiological hindrance to infant feeding may not arise when weighing more immediate health concerns. However, the caesarean section delivery is a major abdominal operation with postpartum consequences for the dyad.

Caesarean section delivery procedure

Caesarean section delivery involves an anaesthetic, an intravenous line for fluids and medication, a catheter for bladder emptying, incisions through multiple layers of tissue, rupture of the amniotic sac and disengagement of the infant from the pelvis. The surgical procedure, combined with the availability of antibiotics and blood transfusions can be a life-saving intervention for both the mother and infant.

The term ‘caesarean section’ is speculated to have derived from the alleged operative birth of Gaius Julius Caesar. However, that his mother, Aurelia Cotta, is recorded as having survived the birth does not support the claim (O’Dowd and Philip, 2000). Recorded caesarean section deliveries were first performed on deceased Roman women in order to provide separate burials for them and the foetuses. This 715 B.C. law was known as ‘lex caesare’, from the Latin meaning ‘to cut’ (Wolff, 1951, in Todman, 2007). The first suggested case of a mother and infant surviving caesarean section delivery was when a Swedish swine-gelder conducted one on his wife in an emergency situation in 1500 A.D. (O’Dowd and Philipp, 2000). Historical records first document a caesarean section birth in 1610 and the first successful English caesarean section delivery was in 1793 (Churchill, Savage, and Francome, 2006). O’Dowd and Philip (2000) recount that early surgeons attempted caesarean section delivery only when there was no other alternative of the extremely high mortality associated with the procedure.

The shift towards more interventionist obstetrics is attributed to a case of British royalty in 1817. Churchill, Savage and Fracome (2006) cite United States National Institute of Health documentation (1982) that Princess Charlotte continued with obstructed labour without intervention of forceps, craniotomy or caesarean section. The scenario ended with a stillborn baby, deceased princess and then suicide by Charlotte’s obstetrician Sir Richard Croft. This event brought Queen Victoria to the throne. The perception of the value in ‘doing something’ was bolstered by the risks of caesarean section declining over the nineteenth century because of instrument sterilisation and publications of medical research.

The hygienic and technical changes in caesarean section deliveries reduced mortality, but calls to limit the rate of caesarean section were prominent throughout the 1900s (Churchill, Savage, and Francome, 2006), even though the rates were comparatively low. The

proportion of childbirth by operative delivery in the United States was only 5% by 1970 (US National Institutes of Health, 1998) and reached 10.7% in England by 1980 (Churchill, Savage, and Francome, 2006). Over the last few decades, the rates have dramatically increased in these countries to 31.8% and 24.1% respectively (Hamilton, Martin, and Ventura, 2009; The Information Centre, 2008).

International rates of caesarean section vary widely from 1.8% in Middle-Africa to 40.5% in Eastern Asia (Betrán et al., 2007). Betrán and her colleagues found that in developed countries the proportion of caesarean births is 21.1% and they estimate that this is how 15% of infants are currently born worldwide. Women of all ages are increasingly undergoing operative delivery (Hamilton, Martin, and Ventura, 2009) but the proportion among older mothers is especially high (Ecker et al., 2001). The observation that these rates are consistently higher than 10-15% range of medical indication calculated by the World Health Organization (1985) suggest that factors other than medical conditions have an impact on the decision for a caesarean section delivery. It has been suggested that indications for caesarean section have remained relatively constant over the last few decades, but the perceptions of the surgery's cost-benefit trade-offs have changed (Leitch and Walker, 1998).

The operation is clinically indicated for a variety of factors, including indications of foetal distress in labour, umbilical cord prolapse, pre-eclampsia or placental abruption (Hanretty, 2003). The modern caesarean technique was pioneered by Munro Kerr and involves an incision across the lower segment of the mother's uterus (Di Renzo and Simeoni, 2006). Caesarean sections are invaluable in certain situations, but the application of such an extensive childbirth intervention provokes the question of the side effects on the mother-infant dyad.

Epidemiology of caesarean section delivery and breastfeeding

The literature surrounding infant feeding is complex because there are many factors that influence intent and outcomes. Breastfeeding is a result of an interaction between many factors and the variables take on different weight in certain circumstances (Al Tajir, Sulieman, and Badrinath, 2006). Only recently have studies been approaching the topic from the maternal perspective. However, most are based on retrospective reports and therefore not as reliable as documentation of events as they are occurring.[1]

Data on breastfeeding after a caesarean section are conflicting, as maternal commitment emerges as the most important influence regardless of birth mode (Avery et al., 2009; Pérez-Ríos, Ramos-Valencia and Ortiz, 2008). Most of the epidemiological literature described below found associations between less optimal breastfeeding outcomes and caesarean section delivery. However, the survey format of the data collection did not enable them to explore the underlying factors that contributed to the findings.

Declercq and colleagues (2009) found that among 1,573 American mothers surveyed at one week postpartum, realisation of exclusive breastfeeding was negatively associated with having undergone a caesarean section delivery. Data from over 500 Australian women also support this negative association at hospital discharge (Scott et al., 2006). Liston and colleagues (2008) examined the medical records in Nova Scotia over a fifteen-year period

[1] Li, Scanlon and Serdula (2008) reviewed the literature and found that in eleven studies, maternal recall of breastfeeding initiation and duration was valid and reliable when ascertained within three years. However, Gillespie and colleagues (2006) found that when they provided questionnaires to American mothers (n = 946) every three weeks for the first postpartum year, that the 184 participants who were interviewed at six months and between one and 3.5 years postpartum overestimated the duration of their breastfeeding compared to when interviewed within three weeks of the event. Importantly, the reasons for weaning were associated with different levels of recall accuracy.

and found that those who had a caesarean section delivery (n = 27,263) were less likely to continue any breastfeeding at hospital discharge than those who had vaginal delivery (n = 115,666). Table 2.1 presents the adjusted odds ratios and 95% confidence interval.

Table 2.1: Breastfeeding post-discharge by birth mode (Liston et al., 2008).

	Adjusted odds ratio (95% CI)	P-value
Compared to spontaneous vaginal delivery:		
- Unscheduled caesarean section in labour	0.79 (0.77 – 0.83)	$p < 0.001$
- Scheduled caesarean section	0.64 (0.60 – 0.67)	$p < 0.001$
Compared to assisted vaginal delivery (forceps or ventouse):		
- Unscheduled caesarean section in labor	0.93 (0.89 – 0.98)	$p = 0.006$
- Scheduled caesarean section	0.74 (0.70 – 0.79)	$p < 0.001$

These data were obtained through health records and the authors did not suggest hypotheses about why breastfeeding was terminated early.

In a representative sample of women in Puerto Rico (n = 1,695), Pérez-Ríos, Ramos-Valencia and Ortiz (2008) found that caesarean section delivery was negatively related to breastfeeding initiation after controlling for confounding variables, odds ratio and 95% CI: 0.64 (0.51 – 0.81). Women who underwent a caesarean section were less likely to breastfeed their latest newborn than those who delivered via other birth modes, but the researchers acknowledge that their study was limited by lack of data regarding women's breastfeeding intent, participants' perspectives on infant feeding and the type of caesarean section delivery.

In contrast, Binns and colleagues (2006) found that Aboriginal mothers (n = 425) in Perth, Australia breastfed for a greater duration compared to non-Aboriginal mothers (n = 556) despite having twice the rate of caesarean section delivery (49.4% versus 17.6% respectively). Their results are limited by the routine hospital provision of 'special support' for Aboriginal people and the group differences in education level, marital status, partners' occupation and parity. Additionally, the research did not specifically aim to measure breastfeeding after a caesarean section. However, data indicate that caesarean section does not necessarily prohibit breastfeeding. The most recent United Kingdom Infant Feeding Survey did not find different rates of breastfeeding initiation or continuation between those who had a vaginal or caesarean section delivery (Bolling et al., 2007).

Few studies have specifically examined post-caesarean breastfeeding outcomes even though this is a novel context for families when viewed in a historical and pre-historical timeline. Venancio and colleagues (2008) interviewed caregivers in the months following delivery in Brazil to ascertain what obstetric factors were associated with subsequent breastfeeding behaviour. Caesarean section delivery was associated with greater formula supplementation compared to that exhibited after vaginal delivery, but data on the reasons were not collected. Rowe-Murray and Fisher (2001) call for study of the mechanisms by which mode of delivery affects health outcomes. Nolan and Lawrence (2009) similarly describe a lack of literature regarding the relational impacts of a caesarean section and recommend interventions to promote maternal-infant proximity during delivery and on the postnatal ward.

It is therefore important to explore maternal breastfeeding experiences after caesarean section delivery to ascertain what, if any birth mode factors, are associated with the outcomes.

Breastfeeding and lactation disruption

In addition to the risks of the surgical procedure (NICE, 2004),[1] there is evidence that the evolutionarily novel experience of caesarean section delivery alters the behavioural capabilities and physiological functioning of mother-infant dyads. Trevathan (1987: 139) proposed the various, interrelated pathways in which caesarean section impacts mothers and their infants in the early postpartum period compared to vaginal delivery after spontaneous onset labour:

- the timing of the delivery, which is important because of the degree of foetal development at different (near-term) gestational ages and the effects of the hormonal profile on the mother and foetal transition to extrauterine life
- delivery medication, which effects mother-infant physiology and behaviour
- alteration of the physical experience of parturition, which again affects mother-infant biological functioning and interaction capabilities.

The relatively few studies that investigated the early postpartum period after a caesarean section are described below. In summary, the research points to impeded mother-infant interaction compared with vaginal delivery through: later maternal-infant first contact; maternal rating of first contact with their newborns less well, with persistent maternal postpartum 'mood disturbance;' suppressed infant rooting behaviour; later breastfeeding initiation; less maternal oxytocin and prolactin in response to suckling; less volume of breast milk transferred over the first few days; less frequent breastfeeding; and delayed onset of lactogenesis II.

Mother-newborn contact

A meta-analysis of the literature found associations with women who had a caesarean section delivery in the expression of less satisfaction with birth, longer time to first interaction with their newborns, lower likelihood of breastfeeding and less home interaction with their infants (DiMatteo et al., 1996). These authors were careful to point out that the relationships do not indicate causation and suggested further investigation though controlled study.

Australian first-time mothers who had caesarean section delivery ($n = 48$) rated their initial interactions with their newborns less favourably than did women after spontaneous onset vaginal delivery ($n = 106$), $p < 0.001$ (Rowe-Murray and Fisher, 2001).[2] These researchers found that the longer elapsed time between birth and first holding the infant, not the amount of time that women held their newborns, was associated with early postpartum mood. The prenatal health of the dyads, gestational length, the presence of a support person during delivery, infant birth weight and newborn respiratory functioning were similar in the birth mode groups. Rowe-Murray and Fisher also found that elevated maternal 'mood disturbance,' measured by the Edinburgh Postnatal Depression Scale and another standardised measure, persisted at eight months postpartum after caesarean section. The authors highlighted that caesarean section delivery was detrimentally associated with the maternal feelings at each of the four study hospitals and suggest that improvement of hospital practices would be unable to eliminate suboptimal mother-infant first contact associated with this mode of delivery. They conclude that although the psychological

[1] Short-term maternal risks include anaesthesia complications, blood transfusion, mortality, infection, instrumental harm, pulmonary embolism, bowel dissention, haemorrhage, wound dehiscence, hospital readmission and an extended recovery period. Long-term maternal complications include being at higher risk for bowel obstruction, ectopic pregnancy, placenta praevia, placental abruption, rupture of the uterus and stillbirth. Infants may experience accidental cuts, respiratory problems and asthma.

[2] Participants who underwent instrument-assisted vaginal delivery ($n = 49$) also rated their first contact significantly less favourably than those did after vaginal delivery without intervention ($n = 106$), $p < 0.001$.

impact on the mothers was sub-clinical, it was important to facilitate early interactions to the extent possible.

Meek and Tippins (2002) warn that a comfortable position to breastfeed can be difficult at first because of maternal movement, lifting and positioning options being limited in the immediate postpartum period. Prevention of a headache from the spinal anaesthesia entails mothers lying flat after a caesarean section (Lawrence and Lawrence, 2005). This is in addition to the discomfort that new mothers can experience from postpartum uterine contraction. Karlström and colleagues (2007) found that maternal pain after a caesarean section delivery affected breastfeeding. Sixty-two percent of participants reported, on a written questionnaire completed at hospital discharge, that their postoperative pain detrimentally impacted their ability to care for their newborns in the first day after a scheduled (n = 31) and unscheduled (n = 29) caesarean section with spinal block anaesthesia. One third of the women said that that their ability to breastfeed was affected negatively by a 'large' or 'very large' degree from their discomfort.

Women who have a caesarean section have been found as experiencing delayed initiation of breastfeeding compared with women giving birth vaginally (Rowe-Murray and Fisher, 2002). The Baby Friendly accredited hospital that was one of Rowe-Murray and Fisher's research locations was associated with significantly better early contact than the other three hospitals. Similarly, a study of healthy mother-infant dyads (n = 500) at a Nigerian hospital found, through a combination of structured questionnaires, medical records and direct observation, that the average initiation of breastfeeding after a vaginal delivery was 3.35 ± 2.6 hours compared to 5.9 ± 1.9 hours after caesarean section with spinal anaesthesia (Awi and Alikor, 2006). The authors suggest that routine practices interfere with breastfeeding initiation, especially after a caesarean section delivery.

Nissen and colleagues (1996) reported that women who had an unscheduled caesarean (n = 17) section delivery saw their infants significantly later than those who had vaginal delivery (n = 20), $p = 0.0001$. Related to this finding was that breastfeeding initiation occurred later in the caesarean section group, $p = 0.0026$. The median and range of the timing in minutes were 75 (49-180) with vaginal delivery and 240 (120-480) for the unscheduled caesarean section. However, use of general anaesthesia in the majority of the caesarean section (10 of 17) limits attribution of the results to hospital protocol because the timing of mother-infant interactions could have been a result of mothers being unconscious in the early postpartum period.

The timing of breastfeeding initiation is important because the early mother-infant contact has been found to be associated with postnatal ward breastfeeding exclusivity (Mathur et al., 1993) and breastfeeding duration (Nakao et al., 2008; WHO, 1998).

Infant cues and capabilities

When mothers are in contact with their newborns, the infants may not exhibit the same interaction and feeding cues after a caesarean section compared to vaginal delivery. The distinction is greatest between non-labour caesarean section and vaginal delivery after spontaneous onset, un-medicated labour. The idea that the innate behavioural repertoire of human infants upon which early parental interaction and breastfeeding are predicated, such as rooting, crying and sucking, are disrupted by the biologically unexpected experience of caesarean section delivery is increasingly featured in medical literature, such as Smith's (2007) review. The human infant would 'normally' be an active participant in postpartum interaction, eliciting proximity-maintenance and conveying hunger (Johnson and Everitt, 2000). Lawrence and Lawrence (2005) report research that found patterned behaviour

among healthy alert newborns that consisted of licking, rooting and self-attachment to the breast (Widström and Thingström-Paulson, 1993; Righard and Alade, 1990).

The universal physiological processes and behavioural capabilities of our newborns represent adaptations to postpartum life (Cartwright, 2000; Eibl-Eibesfeldt, 1989). Breastfeeding is a learned behaviour by both mothers and infants. Infant feeding takes place in the context of interactions with the caregiver, with continuous responses between them (Wells, 2003). Disruptions can lead to a cycle of biologically suboptimal feeding practices. Infant signalling can be suppressed after a caesarean section by lack of labour hormones (Jain and Eaton, 2006), the absence of compression from uterine contractions (Lissauer and Clayden, 2001; Novak, 2005) and surgical anaesthesia plus postpartum medications (Howie and McMullen, 2006). The following overview presents the current range of evidence for caesarean section disruptions in infant physiology and behaviour.

Infant neurobehaviour seems depressed after caesarean section compared to vaginal delivery. Full-term newborns who underwent a scheduled caesarean section (n = 15) were less excitable according to standardised measures during postpartum days 1 and 2 compared to those who experienced vaginal delivery (n = 15) (Otamiri et al., 1991). Otamiri and colleagues found that umbilical cord blood samples showed lower concentration of noradrenaline in the caesarean section participants. Similarly, Vogl and colleagues (2006) found lower levels of adrenaline, noradrenaline and cortisol in umbilical cords after non-labour caesarean section (n = 29) compared to those who had various types of vaginal delivery (n = 74). The authors caution that in rats, alteration of these hormones is associated with impaired brain development (Griffin et al., 2003, in Vogl et al., 2006). The long-term neurological outcomes of term infants who experienced caesarean section delivery are unclear (Adams-Chapman, 2008). The study with the most participants is a sub-sample of the Term Breech Trial (Hannah et al., 2000),[1] but the primary research objective was to detect neonatal differences in infant morbidity and mortality. The follow up data did not show a significant difference in neurodevelopment delay by scheduled caesarean section or vaginal delivery for breech presentation when the children[2] were two years old, p = 0.85.

The evidence that the 'stress' of labour, which gives rise to a surge in catecholamine levels,[3] is actually beneficial in most circumstances[4] was discussed by Lagercrantz and Slotkin in 1986. They suggest that the physical and especially hormonal mechanisms associated with parturition prepare mammalian young for extrauterine life. In summarising various research from human and other animal studies, Lagercrantz and Slotkin suggest that diminished catecholamine levels from a lack of labour render offspring at greater risk of initial: breathing difficulty from inadequate absorption of lung fluid;[5] slower metabolic rate, which has implications for neonatal weight loss because the 'brown fat' is not

[1] Perinatal (foetal and neonatal) outcomes were analysed among 1,039 infants who had a scheduled caesarean and 1,039 who experienced vaginal delivery. The participants had been randomised to the birth modes for breech presentation.

[2] The participants were examined only if the parental completion of a standardised questionnaire indicated an abnormal neurological development range or if the parents did not complete the screening. Of the 455 infants who had a scheduled caesarean and were followed up, 80 were subsequently examined compared to 67 of the 457 who were delivered vaginally and then assessed.

[3] Catecholamines are a group of hormones, including adrenaline and noradrenaline, which are associated with the 'fight or flight' response to stress. The levels at vaginal delivery have been measured at 20 times greater than those of adults (Quinn et al., 1998, in Blackburn, 2007). Pollard (2007) details the effect of adrenaline and points out that the levels vary according to mental stimulation, drug intake and living conditions in addition to physical exertion.

[4] Chen and colleagues (1998) found that high levels of foetal or maternal stress after vaginal delivery (n = 35) impeded early breastfeeding frequency and lactation performance. This data adds that beyond a 'normal' range, stress in childbirth can disrupt behaviour and physiology. This does not detract from the benefit that the 'expected' stress provides.

[5] Respiratory distress is common among infants delivered by scheduled caesarean section. However, Ramachadrappa and Jain (2008) discuss that it is unclear how important this is clinically.

mobilized; altered blood flow, with less is directed to the vital organs;[1] and decreased neurological response, including less dilation of pupils.

Lagercrantz and Slotkin recommend that women who are indicated for a caesarean section delay the delivery until experiencing the onset of labour (1986: 107). The mechanisms that trigger labour are unclear, but seem to be driven by an alternation of foetal hormones (Bribiescas and Ellison, 2008), and so a scheduled caesarean occurs before the infant is biologically ready to be born.

Mammalian alveoli[2] are compressed *in utero* and filled with liquid from alveolar epithelium secretions (Barker and Southern, 2004, in Blackburn, 2007). Blackburn (2007) reports that the fluid supports cell maturation and the development of the alveolar space. Studies of foetal lambs shows that lung fluid remains constant, at 90-95% of the lung weight, through the third trimester and then decreases in the days before spontaneous onset labour (Orzaleski, 1965, and Kitterman, 1979, in Ramachadrappa and Jain, 2008). When rabbit or lamb foetuses are delivered by scheduled caesarean section, they have problems breathing due to the excessive lung fluid retention (Bland et al., 1982 and Berger et al., 1996, in Ramachadrappa and Jain, 2008).

In humans, approximately 65% of foetal lung fluid is normally absorbed by the time of birth (Jab, 2004, and Randell and Young, 2004, in Blackburn, 2007). Scheduled caesarean section delivery may result in infants being delivered before their lungs are prepared for the transition to breathing. Infant respiratory distress syndrome (a severe form of breathing difficulty) and 'wet lung' (also known as transient tachypnoea of the newborn) are most commonly experienced after scheduled caesarean section compared to other birth modes, even when the analysis controlled for gestational age (Jain et al., 2009). These findings regarding neonatal respiratory complications are well documented (see Hansen et al., 2008; Quiroz et al., 2009; Heinzmann et al., 2009).

The lipoprotein surfactant is well known in relation to lung functioning as reducing alveolar surface tension to enable the opening and maintenance of the alveoli space for gas exchange.[3] Surfactant synthesis, which is partly regulated by catecholamines, also decreases foetal lung fluid (Blackburn, 2007). Resorption of lung fluid occurs through epithelial sodium channels that are also triggered by endogenous steroids (Di Renzo and Simeoni, 2006). Although uterine contractions were once thought important for lung fluid removal, it is now thought that there is only a minimal effect through this force (Jain and Eaton, 2006). The evidence suggests that iatrogenic prematurity occurs whenever an infant is delivered without the spontaneous onset of labour.

Recent findings add to the physiological impact of caesarean section delivery on the term human infant. Shen and colleagues (2009) demonstrated that the experience of labour provides immunological protection to term infants. They sampled umbilical cords within five minutes of placental delivery and found that the blood after vaginal delivery (n = 48)

[1] The 'stress' of labour results in foetal blood being diverted from the periphery to the vital organs to enable survival of hypoxic events during parturition. In addition to this process, the different gene expression provokes the question of caesarean section delivery and sudden infant death syndrome. Sangavi (1995) analysed birth and death certificate statistics (from 41,598 live births) in Kentucky for risk factors associated with SIDS. He found that caesarean section delivery was significantly associated with SIDS compared to vaginal delivery: the adjusted relative risk was 2.09 ± 0.58, $p < 0.01$. Sangavi hypothesises that infant death due to respiratory difficulty after caesarean section delivery may be misclassified as SIDS and recommends further research be undertaken to explore the possible relationship between birth mode and vulnerability to SIDS.

[2] Alveoli are the primary site in the lungs for gas exchange. They are expansions of the alveolar sacs and resemble a bunch of grapes at the end of the respiratory bronchiole in diagrams (Rankin, 2005b).

[3] Among humans, surfactant synthesis can be identified at 20-22 weeks gestation and its secretion can be detected at 30-32 weeks (Hallman et al., 1976, in Wong, 1996).

had higher cell counts of total leukocytes, neutrophils, lymphocytes and andmonocytes than that of participants who underwent scheduled caesarean section (n = 14). The researchers hypothesise that this finding is what modulated their other result of differential expression of signals for immune responses, the Toll-like receptor-2 and Toll-like receptor-4. Additionally, Schilinzig and colleagues (2009) suggest that scheduled caesarean section impacts regulation of gene expression. They examined the umbilical cord blood of 37 newborns (vaginal delivery n = 21 and scheduled caesarean section delivery n = 16) and found significantly higher levels of DNA-methylation after the caesarean section delivery. Although this molecular biology is beyond the scope of this thesis, the investigations provide a deeper level of explanation for the increased morbidity associated with the caesarean section delivery.

Infants born by caesarean section delivery may require more suctioning compared to after vaginal delivery, which Smith (2004) warns has effects on infant oral motor function. Additionally, maternal drugs impact the infant and are slow to clear their systems because of the immature state of the babies' liver and kidneys (Trevathan, 1987: 121).

Smith (2004) additionally hypothesises that medications affect infants' facial nerves, thereby inhibiting latching and suckling after a caesarean section. Breastfeeding entails infants manipulating the breast tissue with their jaw and tongue (Rankin, 2005a). Mizuno, Fujimaki and Sawada (2004) found that the type of breastfeeding styles that mothers (n = 1,412) recalled (6-12 months postpartum) their infants as having exhibited in the early postnatal period were associated with breastfeeding duration at 3 and 6 months postpartum, $p < 0.001$. Those who described a rigorous, rhythmic suckling pattern were associated with having breastfed for a greater duration compared to the mothers who cited other infant feeding classifications (which represented suboptimal behaviour such as ineffective suckling or apparent lack of infant interest).

Maternal physiology

Maternal endocrine profiles are affected by caesarean section, especially when the delivery is conducted in the absence of labour. Data suggest later, less effective secretion of the two key hormones associated with lactation – prolactin (milk production) and oxytocin (milk secretion) – after a caesarean section than occurs after vaginal delivery.

A woman is able to lactate[1] from about sixteen weeks into pregnancy, but high levels of progesterone suppress the response (Lawrence and Lawrence, 2005). The expulsion of the placenta at delivery leads to an abrupt fall in maternal progesterone and estrogen levels (Blackburn, 2007). Colostrum is produced by mothers as prolactin[2] levels rise via the pituitary response to the decline in progesterone. This endocrine process initiates lactogenesis II, so some breast milk is synthesised after all deliveries unless placental fragments are retained (Walker, 2006). As discussed by Quandt (1995), reports of lactation without pregnancy (Waletzky and Herman, 1976) and of re-lactation (Phillips, 1993) also exist. However, the process of lactating to convey adequate nutrition for the infant depends on early initiation of suckling or other nipple stimulation such as expressing.

In the absence of nipple stimulation, plasma prolactin levels return to non-nursing levels over the first postpartum weeks (Johnson and Everitt, 2000). With suckling, sensory nerve endings in the maternal areola and nipple are stimulated, which trigger the mother's

[1] Lactogenesis can be divided into two stages: lactogenesis I, the differentiation of the mammary gland so that milk secretion is possible and lactogenesis II, the onset of copious milk production. In humans, colostrum and transitional milk are on a continuum of changes in milk composition during lactogenesis II (Neville, Morton and Umemura, 2001).

[2] Andrews (2005) offers an overview of the physiological regulation of prolactin through pregnancy and its effects on lactation.

hypothalamus to stimulate the pituitary to produce a rapid increase in prolactin and oxytocin production (Lawrence and Lawrence, 2005).[1] Nipple stimulation is the main factor that influences the release of prolactin and the amount of prolactin is proportional to the intensity and frequency of contact (Rankin, 2005c). Circulating prolactin in the maternal bloodstream stimulates milk production through regulation of the lactose-synthetase enzyme system and oxytocin is associated with milk ejection (known as 'let-down') through its effects on cell contraction in the breast (Blackburn, 2007).

The human body's precise responses to physical and psychological stress during childbirth are unknown, but caesarean section may interfere with oxytocin and/or prolactin release (Dewey, 2001). Women who underwent an unscheduled caesarean section (n = 17) have been found to lack a significant rise in prolactin levels 20-30 minutes after the onset of a breastfeeding session compared to those who had vaginal delivery (n = 20), p = 0.03 (Nissen et al., 1996). Although Vogl and colleagues (2006) found significantly greater concentration of prolactin at delivery among women who had a scheduled caesarean section compared to various types of vaginal delivery, $p < 0.05$,[2] the results pertain to the immediate postpartum period not in relation to breastfeeding. Prolactin levels vary among people and their samples were collected at only one point, so the inference that can be drawn from the Vogl research is limited because their samples included significant differences in maternal age or body mass index and the blood was collected on one occasion per participant.

In the research conducted by Nissen and colleagues, women who had experienced unscheduled caesarean had less oxytocin pulses during breastfeeding, p = 0.002, compared to those who had vaginal delivery. There was not a significant difference in maternal cortisol levels between the groups at various points in time in the Nissen study, but lower concentration was found by Vogl and co-researchers (2006) with the scheduled caesarean section group compared to those who experienced the various types of vaginal deliveries, $p < 0.05$, at birth. The data suggest that labour stimulates the release of stress-associated hormones.

The side effects of the stress of childbirth stimulate catecholamines for infant development, but high levels can impede lactation physiology. Dewey and colleagues (2003) described delayed lactogenesis II as being more common if: there was a long duration of labour (more than 14 hours); the mother had an 'urgent' caesarean section; and/or when the infant had a low suckling score on postpartum day 3.

Mammalian females, including women, react to the pain of labour by releasing 'morphine-like' beta-endorphins. In addition to providing endogenous pain relief for the mother, the opioid stimulates the secretion of prolactin (Rivier et al., 1977, in Odent, 2004). As would be expected, maternal endorphin levels (and those transmitted through breast milk) are higher after vaginal delivery versus after scheduled caesarean section, (Zanardo et al., 2001; Vogl et al., 2006).[3] This is important because low level of beta-endorphins has been

[1] Prolactin is secreted 7-20 times a day in human males and females (Madden et al., 1997, in Neville, 2001). Infant suckling leads to surges of prolactin in comparison to the background level.

[2] The samples were of participants who underwent scheduled caesarean section, n = 30, unmedicated vaginal delivery n = 30, vaginal delivery with epidural anaesthesia, n = 21, and vaginal delivery with ventouse extraction, n = 23. Maternal blood was collected within minutes of the births.

[3] Zanardo and colleagues (2001) found that among breastfeeding mothers who were continuously rooming-in with their infants, beta-endorphin concentrations in breast milk of mothers who delivered vaginally after spontaneous onset and no epidural (n = 14) were significantly higher on postpartum day 3 than those of mothers who had a scheduled caesarean section (n = 14), 6.0 ± 0.05 compared to 4.3 ± 0.4 pmol/l respectively, $p < 0.01$). Vogl and colleagues (2006) found that scheduled caesarean section delivery was associated with lower level of maternal beta-endorphins at birth compared to various types of vaginal delivery, $p < 0.05$.

negatively associated with neonatal coordination (Rothenberg et al., 1996, in Blackburn, 2007).

Another mechanism by which caesarean section may alter maternal endocrine profiles is regional anaesthesia, as the medication has been associated with the inhibition of oxytocin release (Lawrence and Lawrence, 2005). In addition to impacting lactation physiology, the lower maternal oxytocin levels after scheduled caesarean section delivery may also lead to less maternal calmness (Odent, 2004; Uvnäs-Moberg et al., 1990; Uvnäs-Moberg and Eriksson, 1996), further impeding the lactation process.

Breastfeeding frequency

Scheduled caesarean section (n = 45) has been associated with less breast milk transfer on postpartum day 2, $p = 0.047$, and day 4, $p = 0.044$, than unscheduled caesarean section delivery (n = 52) (Evans et al., 2003). When these caesarean section delivery participants were combined (n = 97) and compared to vaginal delivery (n = 88), postpartum days 2-5 were associated with less breast milk transfer (after adjustment for breastfeeding experience, parity and timing of first breastfeed) after caesarean section, $p < 0.05$. Infant birth weight was regained by postpartum day 6 in 40% of the vaginal infants, but only 20% of the caesarean group, $p = 0.003$. The authors suggest that the effect of birth mode on lactation is transient. The mechanisms by which breastfeeding outcomes were affected are unclear in this research because they did not collect (or at least present) data on the frequency of feeds.

Nissen and colleagues (1996) reported that by postpartum day 3 infants who had an unscheduled caesarean section breastfed significantly less frequently than those who underwent vaginal delivery, $p = 0.03$, with a median and range of 12 (10-16) with the unscheduled caesarean section versus 15 (14-18) with vaginal delivery. However, the authors do not include a definition of breastfeeding sessions nor do they stipulate how they collected the data. However, the duration of any or exclusive breastfeeding did not vary between the groups, as reported by maternal completion of a questionnaire that they received at two months postpartum and were instructed to return upon breastfeeding termination.

The rate of milk production is based on demand and supply. Galactopoiesis (maintenance of breast milk production) requires nipple stimulation to trigger prolactin secretion and the process depends on the removal of the milk from the breast. Milk stasis from infrequent breastfeeding or insufficient milk removal leads to painful breast engorgement and a feedback protein inhibits further breast milk production (Blackburn, 2007). Maternal nutrition, age, body composition, and parity impact milk volume, but are secondary to the regulation compared to breastfeeding frequency (Lawrence and Lawrence, 2005).

Maternal report of late onset (> 72 hours postpartum) breast fullness has been associated with unscheduled caesarean section compared to other birth modes (Chapman and Pérez-Escamilla, 1999b). Their sample was American first-time mothers (n = 188, 140 of whom had vaginal delivery, 27 underwent a scheduled caesarean section and 25 had an unscheduled caesarean section). In multivariate logistic regression analysis, unscheduled caesarean section delivery was associated with delayed onset of lactogenesis ll: odds ratio and 95% CI: 5.6 (1.8-16.8), $p = 0.002$. Scheduled caesarean section delivery was not associated with delayed onset in the multivariate analysis, 1.4 (0.05-4.4), significant level not provided. However, exclusive provision of formula through postpartum day 2 was associated with the delayed onset, 2.9 (1.3-6.8), $p = 0.015$, as well as a relatively long second stage of labour before vaginal delivery 3.6 (1.3-9.7), $p = 0.010$. These findings support the effect of early prolactin surges on milk production. Chapman and Pérez-

Escamilla suggest that the maternal and/or foetal stress associated with delivery circumstances altered postpartum breastfeeding frequency and recommend that postnatal breastfeeding support include information on the physiological process of lactation.

Sözmen (1992) found that random intervention of breastfeeding initiation at one hour postpartum and continued frequent breastfeeding among caesarean section mother-infant dyads in Turkey led to earlier colostrum 'obtainment,'[1] $p < 0.001$, and earlier lactogenesis II, $p < 0.001$, compared to those who initiated breastfeeding hours later and supplemented breast milk with sugar water. There were 40 participants in total, with half in each arm of the trial. Although the details of the study are sparse, the data suggest that infant feeding behaviour affects lactation physiology after a caesarean similarly to after vaginal delivery.

Suboptimal breastfeeding behaviour[2] was found to be common at a California hospital, with caesarean section delivery cited as a significant contributor (Dewey et al., 2003). Delayed onset of full milk production was most common after unscheduled caesarean section, for 56% of the 28 dyads in this study. With breastfeeding, there is a 'window of opportunity' within which nipple stimulation needs to be initiated to promote production of prolactin receptors in the breast tissue. Prolactin, as with other protein hormones, exerts its effect through receptors on breast cells.[3] It is theorised that these receptors later facilitate milk production once the process switches to autrocrine control (De Carvalho et al., 1983 and Zuppa et al., 1988, in Lawrence and Lawrence, 2005; Ball, 2008). Then, the frequency, intensity and duration of suckling regulate both milk volume and nutrient content (Johnson and Everitt, 2000).

Although lactogenesis II occurs in the absence of colostrum removal over the first few postpartum days, the breast milk composition and volume will not proceed along the continuum to copious production or mature composition in the absence of frequent breastfeeding (Walker, 2006). Additionally, delayed onset of lactation is a public health concern because it has been associated with shorter duration compared to women who experienced earlier onset (Chapman and Pérez-Escamilla, 1999a).

Both physiological circumstances and postnatal environments combine to contribute to the lower breastfeeding rates observed in caesarean populations (Francome et al., 2003; Mander, 2007). Infant breastfeeding requires an uncompromised airway, capability of signalling the caregiver and ability to effectively suckle. Correspondingly, mothers need a conducive hormonal milieu, the ability to correctly position the baby and frequent nipple stimulation.

Methodological issues and the isolation of events in the breastfeeding and lactation research limit the ability to appreciate how the experience of caesarean section delivery impacts infant and maternal capabilities. Trevathan (1987) described maternal-newborn interactions as "just as much a part of the human adaptation as our placenta, mode of locomotion, large brain and helpless infant" (p. 33). Through the lens of evolutionary obstetrics and paediatrics, we would expect that the pharmacological, physiological and physical circumstances surrounding caesarean section render human dyads vulnerable to suboptimal infant feeding outcomes.

[1] The article does not specify how colostrum was measured. This lack of information limits the meaning of the results.
[2] Breastfeeding measures included maternal confidence, timing of breastfeeding initiation, breastfeeding frequency, formula supplementation and pacifier use.
[3] Johnson and Everitt (2000) describe that the processes of milk protein passing through the Golgi apparatus and being released depend on the presence of prolactin receptors (p. 237).

Breastfeeding entails maternal balance between self and infant care. For many human mothers and babies, the implications of caesarean section delivery may push them beyond what Lozoff and colleagues (1977) referred to as the "limits of their adaptation." The physiological alterations, physical impediments and disruption of infant signalling of feeding combine to pose compounding obstacles for the breastfeeding dyad. Trevathan (1987) discussed that a strength of human life is our capacity for behavioural flexibility, but the "degree of alienation" imposed by some parturition intervention and infant separation may be harming our health (p. 233).

Breastfeeding support

Recommendations from previous research

Epidemiologists who research breastfeeding after a caesarean section advocate for the development of interventions to provide tailored assistance to women. Although breastfeeding and lactation obstacles can be resolved, many mothers do not have the adequate postpartum guidance and support necessary (Dewey, 2001). Dewey and colleagues (2003) suggest improving breastfeeding by alteration of the modifiable factor of caesarean section delivery rates and provision of "special attention and follow-up of mother-infant pairs at risk" (p. 618). The approach of minimising the number of mother infant dyads in this context and better supporting the ones who are is shared by Pérez-Ríos, Ramos-Valencia and Ortiz (2008). Rowe-Murray and Fisher summarise the sentiment in the literature that:

> attention to specific features of the environment after cesarean birth is fundamental to facilitate early mother-infant contact and improvement in rates of early breastfeeding initiation (2002: 129).

Although a longer inpatient stay has been suggested to help caesarean section dyads initiate breastfeeding (Patel, Liebling, and Murphy, 2003), this is not physically or economically feasible in many settings nor was the extended postnatal time adhered to among women in such a trial with all birth modes (Winterburn and Fraser, 2000). Postnatal care might be modified so as to be more appropriate to evolved maternal and infant needs.

The policy of rooming-in on the postnatal ward enables more frequent contact with caregivers, which is physiologically 'expected' from an infant's point of view and conducive to lactation, than nursery care (McKenna and McDade, 2005). Previously, childbirth in hospitals was initially followed by infant separation into nurseries for issues related to infection control. Cassidy (2006) reports that industrialisation in the eighteenth century created dire living conditions, to which European and American governments responded with buildings for supporting the destitute. However, puerperal sepsis or 'childbed fever' became rampant in these locations due to lack of knowledge regarding the importance of hand washing. From the beginning of hospital birth, infants were routinely separated from their mothers.

As hygiene and medical training improved, more women gave birth in hospitals so that they could receive pain medication. Cassidy states that in around 1914, news spread that doctors had created a combination of the amnesiac scopolamine and the anaesthetic morphine that enabled women to give birth while conscious but prevented their remembrance of the experience. This amnesiac-anaesthetic came to be known as 'twilight sleep' and was widely popular despite the side effect of women losing their inhibitions and needing to be strapped down to prevent harming themselves. Ball (2008) discusses that in addition to the (unrecalled) traumatic deliveries during this time, women were initially unable to care for their infants who were physically depressed from the drugs. Newborns therefore were looked after in nurseries while mothers were instructed to rest.

Although twilight sleep is no longer used, this history may contribute to the slow implementation of 24-hour postnatal ward rooming-in despite data of its benefits (Enkin et al., 2000). The change in clinical practice is considered a radical move by some hospital staff and mothers (Young, 2005; Svensson, Mattiesen, and Widström, 2005). However, the proportion of UK hospital-born infants who stayed by their mother for the entirety of their postnatal ward stay is increasing: 82% in 2005 compared with 79% in 2000 and 74% in 1995 (Bolling et al., 2007).[1]

A reason for hesitancy to promote rooming-in is concern that infants disrupt maternal sleep. Contrary to this objection, various studies have found no difference in the amount of maternal sleep obtained between rooming-in and nursery hospital arrangements (Keefe, 1988; Waldenström and Swenson, 1991). Similarly, Quillin and Glenn (2004) found that breastfeeding mothers got more sleep when they coslept with their 4-week-old infants compared to those who had the babies out of sensory range and the researchers call for the development of methods or devices that allow breastfeeding mothers and newborns to safely sleep next to each other.

Encouraging mothers and infants to remain together twenty-four hours a day and encouraging unrestricted breastfeeding are two of the Baby Friendly Hospital Initiative (BFHI) "Ten Steps to Successful Breastfeeding" (WHO, 2009b). BFHI accredited postnatal wards are associated with greater rates of breastfeeding initiation (Bartington et al., 2006; Philipp et al., 2001), exclusivity (Cramton, Zain-Ul-Abideen, and Whalen, 2009) and duration (Merten, Dratva, and Ackermann-Liebrich, 2005). This relationship is consistent with an evolutionary perspective that sees proximity as an "essential first step to lactation and the ensuing processes that forge powerful ties between mother and baby" (Hrdy, 1999: 534).

The World Health Organization states that standard postpartum care should include the infant "in [the mother's] bed or within easy reach" (2006: J10). An anthropological lens on mother-infant interactions leads one to question whether rooming-in with a standalone cot provides sufficient opportunity for extending skin-to-skin contact and enabling breastfeeding (Ball, 2008). Ball states:

> From both physiological and evolutionary viewpoints, the clinical model of rooming-in as a mechanism for keeping mothers and babies together, and thereby facilitating frequent feeding attempts, would appear less than ideal (p. 133).

Ball (2008) cites the fact that non-human primate infants are in almost continuous contact with their caregivers, including night-time. She found (2006) that the randomised postnatal ward infant sleep arrangements within the rooming-in scenario affected breastfeeding frequency. That the maternal bed or side-car crib led to more frequent breastfeeding sessions during the observation period than those allocated the regular standalone cot[2] suggests that some of the breastfeeding obstacles currently encountered "remains an iatrogenic consequence of the physical separation of mothers and infants imposed by a rooming-in scenario" (Ball, 2008: 133). Odent would agree because he states that the priority for maternity care should be "not to get in their [mother-newborn] way" (2003: 80).

[1] Bolling and colleagues (2007) add that for 8% of cases in 2005, continuous rooming-in was not possible due to receipt of intensive care.

[2] Ball and colleagues (2006) found that among mother-newborn dyads who underwent vaginal delivery without opioid analgesia, those who were randomly allocated to have the side-car crib breastfed more frequently than those allocated the standalone cot, $p = 0.013$, and those allocated to have the infant sleep in the mother's bed also breastfed more frequently than those allocated the standalone cot, $p = 0.003$. There was not a significant association between side-car crib or maternal bed allocation and breastfeeding frequency observed, $p = 0.93$.

Previous research has found that mother-infant proximity promotes breastfeeding frequency. As previously described, Ball and colleagues (2006) found that random allocation of the different rooming-in arrangements was associated with breastfeeding frequency, but caesarean section delivery was an exclusion criterion due to its complicating effects on breastfeeding. My research builds on their work; I investigate the impact of random allocation of two of the rooming-in scenarios on breastfeeding frequency after a scheduled caesarean section. I did not adopt the bedsharing condition as an arm of the study for two reasons. Ball and colleagues found that its allocation did not lead to a significant difference in breastfeeding frequency compared to the side-car crib and bedsharing was associated with significantly greater potential infant breathing risk than the side-car crib, $p = 0.027$.

The results of their trial with dyads who had vaginal delivery documented the benefit of side-car cribs, but the study hospital and the vast majority of other National Health Service hospitals continue to use standalone cots for all rooming-in newborns. The Programme Director of the UNICEF UK BFHI supported my research in a letter to the Newcastle and North Tyneside Research Ethics Committee:

> The positive result [of Ball et al., 2006] adds to the anecdotal evidence from professionals and mothers that side-car cribs are beneficial. However, it would be difficult to argue the case for changes in practice and the universal adoption of side-car cribs based on the results of a single study and therefore further studies are urgently required. The proposed study will add evidence to the debate about whether investment in side-car cots is justified. It will also provide evidence as to which mothers should be given priority when only a limited number of side-car cribs are available (S. Ashmore, personal communication, August 2006).

I decided to conduct a breastfeeding intervention trial to build on the study conducted by Ball and colleagues (2006). I recognise that the type of cot that mothers have during rooming-in is one of many aspects of their childbirth environment that may be amenable to more 'baby-friendly' status. There are a multitude of breastfeeding interventions applied in hospital settings that offer psychological, clinical, practical or interrelated support (see Dyson et al., 2006).

The current study

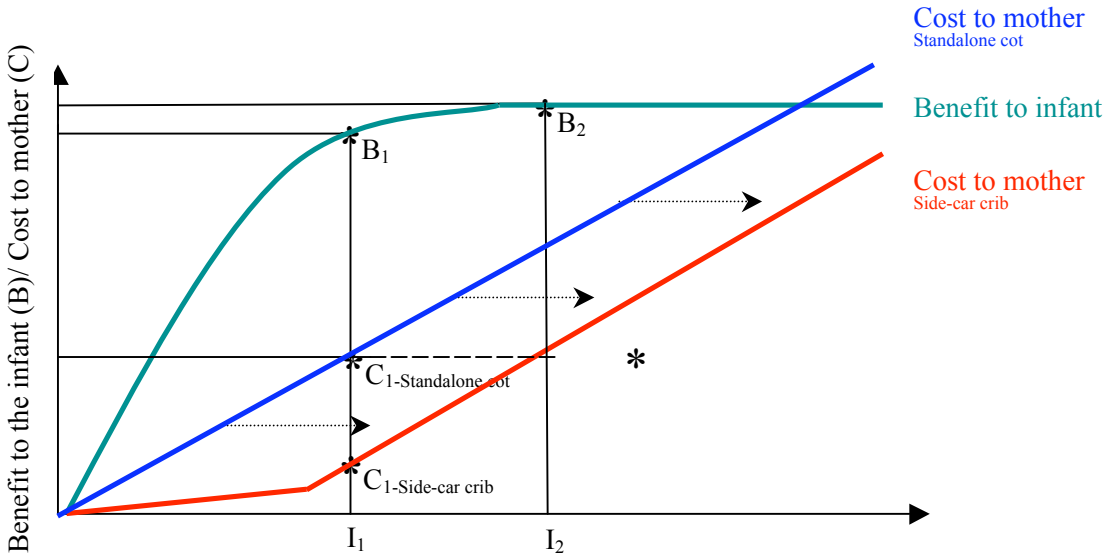
My research contributes a framework for exploring maternal breastfeeding intentions and the process of realising them in an attempt to document the variables that can be most improved for enabling breastfeeding after a caesarean section. The qualitative data collected in Phases 1 and 2 provide some insight into the factors that mothers identify as important for their infant feeding intentions and realisation. Dykes (2006: 47) points to two key limitations in breastfeeding literature: there is little account of the context in which women are supported and few observational data are available to supplement descriptions [of breastfeeding obstacles].

When designing Phase 2, I predicted that the side-car crib would reduce the maternal cost of breastfeeding. Rooming-in with a standalone cot may permit frequent breastfeeding while the side-car crib may make it easier to do so. The purpose of investigating the standalone cot and side-car crib was to improve postnatal ward breastfeeding support. Such research is based on equipoise, which is the obligation to conduct research when uncertainty exists about which type of 'treatment' is more beneficial (Allmark and Spedding, 2007). The concept derives from the Hippocratic Oath (Chadwick and Mann, 1950). It is unethical to randomise people to receive a treatment that data suggest as inferior (Buchanan, 2006). Although Ball and colleagues (2006) found that the side-car crib promoted breastfeeding compared to the standalone cot among women who had

vaginal delivery, no research had tested this intervention among a caesarean section population. Medical tenets stipulate that research should be undertaken when doubt exists regarding a treatment's benefits and risks. Failure to investigate may allow ineffective or harmful clinical practices to persist (Stephenson and Imrie, 1998).

The intervention is consistent with Reiches and colleagues (2009) discussion of buffers to parenting effort. I hypothesised that the effect would be an increase in maternal investment, measured through the proxy of breastfeeding frequency. I anticipated that the side-car crib would allow mothers to devote effort "at higher average levels than would be attainable by an energetically isolated individual" (Reiches et al., 2009: 424) and therefore shift their cost line right. Graph 2.2 shows the predicted effect of maternal cost of breastfeeding at a certain point in time decreasing with side-car crib provision. At investment level I_1, the cost to the mother is reduced from $C_{1\text{-Standalone cot}}$ to $C_{1\text{-Side-car crib}}$.

Graph 2.2: Theoretical mother-infant health trade-offs with breastfeeding at a certain point in time when the side-car crib reduces the perception and/or actual effort required for the mother compared to the standalone cot.



In Graph 2.2, the dotted line highlights that maternal cost is maintained at the same level as investment increases from $I_{\text{Standalone cot}}$ to $I_{\text{Side-car crib}}$. This represents my hypothesis that the intervention would lead to more investment (I_2 instead of I_1) and greater infant benefit (B_2 instead of B_1). The null and alternative hypotheses are presented in Table 2.2.

Table 2.2: Phase 2 hypotheses.

H_o	The frequency of observed breastfeeding in the side-car crib group would be no different compared to the standalone cot group
H_A	The frequency of observed breastfeeding in the side-car crib group would be greater compared to the standalone cot group

I anticipated breastfeeding variation among individuals in both randomly allocated groups, but I predicted that the median frequency of breastfeeding sessions would be greater in the side-car crib group compared to the frequency of those allocated to use the standalone cot. The hypothesis was based on previous research that associated greater breastfeeding with: compact spatial arrangements of home dwellings compared to those that were more dispersed over larger spaces and more floors (Quandt, 1981), mother-infant bedsharing in a laboratory environment compared to the infant sleeping in a standalone cot in a separate

room (McKenna, Mosko and Richard, 1997), hospital rooming-in with the infant in a standalone cot next to the maternal bed compared to the infant being in nursery care in a separate room (Yamauchi and Yamanouchi, 1990) and hospital bedsharing or side-car crib allocation as the infant sleep location compared to the standalone cot among vaginally-delivered dyads (Ball et al., 2006).

Enhanced mother-infant postnatal proximity should lead to more frequent breastfeeding because less effort needs to be expended to physically reach and position the infant and also because mothers may more quickly recognise subtle signs of infant hunger. Hrdy (1992; 1999) suggests that the best way to envision maternal investment is to consider the various conditions that will affect the likelihood of a particular response. Side-car cribs position infants in the mother's line of sight so she may more easily see rooting behaviour - that is often depressed by anaesthetic/ analgesic (Hale, 2006). As discussed in Quandt (1995), more frequent breastfeeds were observed among 'on-demand feeding' European-American mothers in the United States who lived in compact dwellings than those in more spread-out homes (Quandt, 1981). The research was conducted before use of infant intercoms and the results were attributed to the greater maternal awareness of infant activity enabled in unpartitioned space. The side-car cribs may similarly promote maternal perception of infant breastfeeding interest and lead to shortened feed intervals.

This research is designed to contribute to understanding of the capacity to breastfeed after a caesarean section delivery, test a breastfeeding intervention that is consistent with WHO recommendations and is grounded in both the physiology of lactation and an evolutionary perspective on mother-infant interactions.

Summary

The consequences of caesarean section delivery on breastfeeding have so far received little attention, with various aspects of women's experiences that contribute to the outcomes acknowledged only in isolation. The degree of impediment is unclear since epidemiological studies offer conflicting data on the breastfeeding rates post-caesarean section compared to after other birth modes. However, broader influences on breastfeeding, such as timing of initiation, are detrimentally impacted with a caesarean section (Chapman and Pérez-Escamilla, 1999b; Dennis, 2002).

Breastfeeding entails both harmonious and discordant interests for the mother-infant dyad. From the mother's perspective, the practice requires prolonged behavioural and physiological effort. The healthy infant will strive for a greater level of investment than that which most profits the mother, so the amount of actual breastfeeding depends on the (combination of perceived and actual) cost to the mother and benefit to the infant. I extend the parent-offspring conflict model put forth by Trivers (1974) to conceptualise breastfeeding after a caesarean section and predict the effect of the randomised postnatal ward intervention.

Trevathan (1987) highlighted the importance of an evolutionary perspective on the impact of caesarean section delivery on the mother-infant dyad, but this population had been unstudied within the framework until now. The novel context for breastfeeding is expected to lead to mismatches from 'expected' conditions. The qualitative research was designed to explore connections between undergoing caesarean section delivery and breastfeeding outcomes.

Overall, the infant feeding literature suggests that maternal commitment is one of the most important factors in breastfeeding realisation regardless of birth mode (Avery et al., 2009; Pérez-Ríos, Ramos-Valencia and Ortiz, 2008). The postnatal ward infant side-car crib may

reduce maternal cost of breastfeeding compared to the standalone cot after a caesarean section.

Chapter 3 discusses the rationale for the way I collected data to document mothers' perspectives of delivery consequences on infant caretaking. The side-car crib intervention was anticipated to reduce the maternal cost of breastfeeding on the postnatal ward and thereby lead to increased breastfeeding frequency. The ethological approach to observing interactions as they naturally occur inspired the video recording of mothers and their newborns on the postnatal ward. This permitted both quantification of certain behaviours to test the effect of the side-car crib on promoting breastfeeding and also enabled insight to supplement participant descriptions of issues such as maternal mobility and infant access.

Chapter 3: Methodology

The issues addressed within this chapter are the research design, ethical approval for the project, preparation I undertook before conducting the research, the study protocol and my data analyses.

The methods adopted in the two phases of the project are outlined in Table 3.1.

Table 3.1: Outline of the research methods.

	Phase 1	Phase 2
- Location	Royal Victoria Infirmary (RVI) postnatal Ward 32 in Newcastle, England	Same as in Phase 1
- Funding	Parkes Foundation, Cambridge Anthropology Department	Owen F. Aldis Fund, International Society for Human Ethology
- Ethical approval	Newcastle and North Tyneside NHS REC 2 and Durham Anthropology	Newcastle and North Tyneside NHS REC 1, County Durham and Tees Valley NHS REC 2 and Durham Anthropology
- Clearance	Honorary RVI research associate contract, Newcastle Hospital Occupational Health and Criminal Records Bureau	Same as in Phase 1
- Methods	A semi-structured interview with each participant on the postnatal ward and then brief semi-structured telephone interviews every two to four weeks over six months	The side-car crib or standalone cot was randomly allocated to participants before delivery; a semi-structured interview on the postnatal ward; participants used a remote control to recording themselves and their infants over the second postpartum night; a brief semi-structured interview in the morning after filming and then brief semi-structured telephone interviews every two to four weeks over six months
- Recruitment	I opportunistically approached women on the postnatal ward	The RVI antenatal ward secretary distributed information packets to women upon caesarean section booking; I approached women at hospital appointments the week before their delivery. After the original recruitment period, additional participants were recruited through the ongoing NECOT trial at the RVI (see p. 51)

Table 3.1: Outline of the research methods (continued).

- Analyses	Thematic content analysis by organising verbatim statements into Excel and then using Chi-square and Fisher's exact tests of significance on quantified categories of the responses	Qualitative data same as in Phase 1 Continuous focal sampling of video data with an established behavioural taxonomy and Noldus: The Observer. Median frequencies and proportions of behaviours were entered in SPSS to calculate mean group differences, 95% confidence intervals and the Mann-Whitney U test of significance

Study location

I chose the Royal Victoria Infirmary (RVI) as the setting for the research because it is a tertiary-level hospital that hosts over 5,000 births per year. The RVI is a British National Health Service hospital located 20 miles north of Durham University in Newcastle-upon-Tyne, England (Image 3.1). This type of hospital has more highly specialised staff, more technical equipment and a greater number of hospital beds than secondary- or primary-level hospitals (Barnum and Kutzin, 1993). The relatively large scale of the RVI meant that caesarean section deliveries were regularly performed.

Image 3.1: Northeast England map.

Accessed January 2009 at http://leisure.ordnancesurvey.co.uk/

Study design

Interviews

My interview design builds on that of Churchill, Savage and Francome's (2006) postal-administered questionnaires. I utilised many of the same questions, but my research was conducted while the events were unfolding, not in retrospect. In constructing my interview topics, I was also influenced by the issues raised in a caesarean birth information booklet produced by the United Kingdom National Childbirth Trust (Derrick, Lowdon, and Barlow, 2004).

Interview questions were worded in a non-leading manner, such as "how's the feeding going," "has anything or anyone impacted the way you are feeding" and "are there any factors that you think have influenced your baby's ability or desire to feed" (Appendix A,

pp. 226-230 and Appendix C, pp. 241-243). When participants occasionally asked if a specific question was directed at the impact of their caesarean section, I replied that I was inquiring about any factors that were important to them. Most of the questions were open-ended so that women spontaneously offered their own views to the prompts. This study was therefore designed to contribute more objective insight into the participants' experiences in contrast to the Churchill and colleagues' "did you ask for a caesarean section" and "do you think that women who have a caesarean section suffer."

I opted for a semi-structured format instead of the open-ended general questions of an unstructured interview or the sequential list of topics covered in structured interviews (Bryman, 2008). In order to gauge the commonality of participant perspectives and experiences, I wanted the same set of topics to be addressed by each woman. At the same time, the semi-structured interviews provided a flexible format that allowed me to adapt the conversation to participant responses. Participant self-administered questionnaires would have been cheaper and quicker to administer, but this method does not provide as much depth of meaning and has lower response rates (Bryman, 2008). Additional benefits of the semi-structured interview design were the encouragement of participants to provide spontaneous responses and the opportunity for me to clarify meaning when necessary. Overall, I chose the semi-structured approach to extract issues, including unanticipated ones, which were important to participants at the time they were interviewed. The absence of a predetermined range of responses meant that the exclusion of a particular response by a participant did not necessarily mean it was not applicable. I did not intend to conduct a survey, so the statistics on the qualitative data are meant to indicate the commonness and differences with spontaneously reported issues. Multiple regression analysis was not appropriate due to the relatively small sample size (Tabachnick and Fidell, 1996).

A focus group approach would have included debate among mothers in response to my questioning. This method would have explicitly addressed consensus on prompted topics and has previously been used to discuss sensitive issues among new mothers (Darvill, Skirton, and Farrand, 2008; Forster et al., 2008). However, a literature review did not reveal any projects of this kind that were conducted on a postnatal ward. I decided that focus groups would not have been practical for this study. This was due to a lack of private space on the RVI postnatal ward to conduct the group discussions and the unpredictability of participant availability at any one time.

Although an ethnographic approach was utilised to the extent possible, participant observation over extended periods of time was not feasible due to hospital restrictions on the number of people allowed in the operating theatre, recovery room and postnatal ward. Ethnography involves documentation of how phenomena are perceived, ordered and categorised by participants (Ferraro, Trevathan, and Levy, 1994). The knowledge is gained by a researcher engaging in daily life within a cultural milieu other than his/her own for an extensive period of time. Ethnographers approach research with certain preconceptions, but then follow participant interests (Evans-Pritchard, 1973). My research did not aim to present a comprehensive overview of the caesarean section experience, but rather to record specific difficulties with postnatal ward breastfeeding after a caesarean section.

In addition to the semi-structured interviews, my study design included documentation of breastfeeding-relevant aspects of participant hospital notes (Appendix E, p. 251). Telephone follow-up was among those who intended to continue breastfeeding after hospital discharge to document factors that influenced breastfeeding duration.

Observation
The null and alternative hypotheses were presented in Table 2.2 on page 31.

The standalone cots were RVI property and the (four) side-car cribs were purchased from Bristol Maid Hospital Metalcraft (of Bristol, England) for previous Durham Anthropology Sleep Laboratory research (Ball et al., 2006). Existing hospital policy covered the side-car crib use.

Randomised controlled trials ideally 'blind' the participants and the researcher to which individuals receive a particular treatment in order to reduce the risk of bias (Jadad and Enkin, 2007). In this project, the different cot type was obvious to all involved, so the intervention is classified as 'open' instead of 'single-' or 'double-blind.' Although the control or intervention was evident, I presented the study to participants as a general investigation of the mother-infant interactions that occur while they used the standalone cot or the side-car crib. Infant feeding was listed on the Letter of Invitation and Participant Information Sheet (Appendix C, p. 235 and p. 236) as one of the behaviours of interest, but the hypothesised effect of the cot types on breastfeeding behaviour was not conveyed. I purposefully blinded participants to the hypotheses being tested to reduce possible performance bias.

The videotapes allowed me to capture unique insights into maternal-infant postnatal interactions, but by capturing images of participants, I intervened in their experience. The 'Hawthorne effect' refers to differential participant behaviour due to them knowing that they are part of a research project (Torgerson, 2006). Participant awareness of being observed may have altered the mothers' behaviour in a myriad of ways, but the newborns were not aware of the recording. The infants could be expected to elicit caregiving and respond to their mothers as normal. Since the video equipment was equally visible in both arms of the trial, I did not expect it to bias the impact of the cot types on breastfeeding. Similar night-time video documentation of parent-infant interactions has been assessed and successfully completed in home, laboratory and hospital environments.[1]

Another potential source for bias that I minimised was that derived from differential midwifery care between individuals in the two arms of the trial. Prof. Ball and I held multiple meetings with midwifery management before I initiated this phase of the research. I explained the details of the conduct and the purpose and asked the staff to provide care as normal so as not influence participant behaviour. The midwives referred to the trial as the 'Sleep Study' among themselves and participants since it was conducted at night. This reference was positive in that there was no mention of breastfeeding, but it unwittingly created some difficulties. It became apparent when I spoke with participants that there was confusion among the mothers as to what behaviour I was 'looking for.' To allay concern that I might not see much sleep on the tapes, I reiterated to each participant that I was interested in her overall night-time experience with her infant. I explained that I understood a portion of her time would not be spent sleeping or in bed. Participants were assured that activity other than sleep was an important part of the research because I was interested in understanding the entirety of their night.

I chose a parallel design for the experiment. The groups of participants were allocated only one of the cot types to use while on the postnatal ward. This differs from a cross-over design in which participants would have used both the standalone cot and the side-car crib. The within-participant comparison obtained from a cross-over trial would not have been an

[1] For example, see McKenna, Mosko, and Richard (1997), Ball and Hooker (1998), Ball (2002), Ball (2006a), Ball (2006b), Ball and colleagues (2006), Ward-Platt and Ball (2002) and Baddock, (2004).

appropriate design since there is a learning curve involved for breastfeeding mother-infant pairs and due to the lingering effects of anaesthesia.

To ensure internal validity of the study, I designed and conducted the randomised controlled trial in alignment with the Consolidated Standards for Reporting Trials (CONSORT) protocol (Altman et al., 2001; Moher, Schulz, and Altman, 2001; Zwarenstein et al., 2008). The guidelines provide a list of research protocol sections and project examples to assist researchers in including the appropriate components in their trials. The CONSORT statement also outlines presentation of the study design to aid in communication with participants and in publications.

Ethics and funding

I was the Principal Investigator for both research phases, with Professor Ball and Royal Victoria Infirmary Consultant Paediatrician Doctor Martin Ward-Platt as co-investigators. The Newcastle upon Tyne Hospitals NHS Trust sponsored the research and the Durham Anthropology Department approved the protocol. I received clearance from the Newcastle General Hospital Occupational Health Department and Criminal Records Bureau before initiating recruitment. I held an honorary research contract at the Royal Victoria Infirmary when conducting both phases.

Phase 1 ethical approval was obtained from the Newcastle and North Tyneside Research Ethics Committee (REC) 2[1] and from the Durham Anthropology Department. I was awarded financial support from the Cambridge University Department of Anthropology Parkes Foundation.

Phase 2 ethical approval was obtained from the Newcastle and North Tyneside Research Ethics Committee REC 1[2] and from the County Durham and Tees Valley REC 2.[3] Indemnity arrangements for the trial, covering negligent harm, were secured though Durham University. The certificate number through U.M. Association Limited was UM050/00. I was awarded financial support for the research from The International Society for Human Ethology Owen F. Aldis Fund.

A small gratuity to participants was provided in the form of gift cards to the company Boots The Chemists (based in Nottingham, England).[4] Compensation such as these gift cards is the norm for similar research projects (Ball et al., 2006; Martin and Marker, 2007; Higley and Dozier, 2009). Phase 1 participants did not receive payment for taking part in the face-to-face hospital interviews. Those who also participated in the telephone follow-ups were sent a £5 gift card upon completion of the interviews. Five pounds was the greatest amount available, given the sample size and funding secured. Phase 2 participants were provided a £10 gift card the morning after filming. The few women who were recruited through the North East Cot Trial (NECOT) were provided with a £25 gift card in recognition that they spent time and effort in research in addition to NECOT (see p. 51).

Steps taken to ensure the ethical conduct of research included: the use of participant code numbers; keeping participant contact information separate from recorded responses; encouraging the mothers to skip any question that they did not feel comfortable answering keeping files in the secure Parent-Infant Sleep Laboratory updated and being otherwise organised with the research project.

[1] The Central Office for Research Ethics Committees (COREC) reference number was 06/Q0906/4.
[2] COREC reference number 06/Q0905/104.
[3] COREC reference number 07/H0908/57.
[4] 'Boots' stores are located throughout Great Britain and sell a range of health, beauty and everyday products. Their advantage card does not award points for human milk substitutes designed for infants six months of age and younger.

Questions asked in the semi-structured interviews were sensitive in nature. The most important ethical issue was awareness of the trust that participants placed in me when deciding to participate and when they discussed topics that might have been embarrassing or upsetting. Childbirth and the immediate postnatal period can include traumatic or disappointing experiences alongside happiness and relief. However, I felt that it was ethically permissible to ask feeding and other questions about maternal-infant interaction because new mothers benefit from being listened to and voicing their perspectives of the occurrences (Callister, 2004; Beck, 2006). I emphasised to each participant before commencing the interview that if she preferred not to answer any question, she could indicate this by saying 'pass.'

Although it is important to adhere to the study design, the woman's experience taking part was my priority while conducting the research and alterations to the interview schedule were adopted when needed. Research with human subjects involves a trusting engagement and data collection comes second to the well-being of participants (Banks, 2001). On various occasions when participants became visibly distressed, I made a judgment as to whether it was best to ask if it was a suitable time to continue the questioning or I refrained from asking further points on the upsetting topic. I made a note on my interview sheet to explain the missing data. Breastfeeding is an inherently personal area for research because of the expectations and stakes involved. The fact that these interviews occurred contemporaneously with breastfeeding initiation in the context of postpartum adjustment after a caesarean section contributed to the need to prioritise respect for families. It would have been unethical to convey insincere friendliness to gather data (Hoeyer, Dahlager, and Lynöe, 2005) or to pressure participants to address any topics.

Interview quotes included in this thesis refer to participants anonymously by their code numbers and some characteristics. Double quotes signify phrases used by women when discussing the topics. Confidentiality of personal data was ensured through the utilisation of the participant codes as an immediate and consistent anonymisation. I verbally explained confidentiality and the terms were described in the Participant Information Sheet.[1] Women were informed that the confidentiality applied to all of their responses except if I received information that was required by law to disclose (e.g. child at risk). If a mother expressed difficulty bonding with her infant or indicated she has thought about harming her infant in any way, she would have been be encouraged to speak to her health visitor. I liaised with Professor Ball regarding such occurrences for guidance. If I had considered an infant as being in danger, the mother's midwife, health visitor and/ or GP would have been immediately informed.

In Phase 2 of the study, I repeatedly checked with participants how they felt about being filmed. I telephoned the postnatal ward in the afternoon of filming to permit the participant's midwife to confirm how the woman felt about continuing with participation, since my presence might have put pressure on her to agree. Both before and after setting up the filming equipment I asked each participant if she were happy to proceed.

I was conscious not to pressure the women, and in one instance dissembled the equipment when a participant changed her mind about filming. I consulted with the mothers regarding where they preferred for me to position the recording equipment, so that they could easily have access in pointing the remote or manually adjusting the videocassette recorder if they desired to halt filming. Although I reiterated that the recording was for research purposes, I explicitly encouraged them to turn off the video camera if it caused a disturbance. The

[1] See Appendix A, p. 223, Appendix B, p. 232, Appendix C, p. 238, and Appendix D, p. 248.

need to obtain accurate breastfeeding data for the research had to be balanced against the harm imposed on the mothers and their infants.

Participant contact details were not required for enrolment, but the information was collected if a woman opted to later receive a summary of the research results. A summary of the research results was sent to participants and findings made publicly available on the Durham Parent-Infant Sleep Laboratory website, http://www.dur.ac.uk/sleep.lab/. Filmed participants were offered a full copy of their videotape. Women had the opportunity to provide feedback directly through me or via the website. I did not directly seek respondent validation of the study findings because the conclusions presented the sample as a whole.

The funding bodies approved of the study proposals and received summary reports but had no other involvement. Progress and final reports were provided to the research ethics committees. In accordance with the Uniform Requirements for biomedical writing (WAME, 2008), there was no conflict of interest from infant formula companies or any other agencies. I confirm that no relationships inappropriately influenced the design, conduct or analysis of the research.

Phase 1

Phase 1 sample size calculation

The initial interview research was designed to be exploratory, so the sample size was based on practicalities instead of the statistical calculations that underlie hypothesis-driven investigations. There are no universal criteria for sample size in exploratory research because the number of participants is dependent on the data-gathering method and topics investigated (Bryman, 2008).

I estimated a sample of up to one hundred enrolled participants to be an obtainable target. According to the The Newcastle upon Tyne Hospitals NHS Foundation Trust Department of Information Management, the Royal Victoria Infirmary had 5,231 live-born infants delivered in the year 2005-06 and 5,471 in 2006-07 (L. Hobson, personal communication, December 2007). The 2004 rate of caesarean section delivery at the RVI was 21.9% (Churchill, Savage, and Francome, 2006). According to these figures, about 100 women have caesarean section deliveries at the RVI per month.

Phase 1 inclusion and exclusion criteria

The inclusion criteria are on the Participant Information Sheet (Appendix A, p. 222). The criteria specified that mothers must be at least eighteen years of age at the time of enrolment, in good health and experienced a caesarean section delivery. I approached women after either unscheduled and scheduled caesarean sections to compare how the circumstances of the deliveries impacted postnatal ward breastfeeding. The initial interview phase was open both to mothers who initiated breastfeeding and those who did not do so following a caesarean section. Women with varying ages over eighteen, medical conditions, ethnic origin, nationality or sexual orientation were not differentially recruited or enrolled. The purpose for not having infant feeding method as an inclusion criterion was to ascertain the ways in which undergoing a caesarean section delivery impacted on the outcome of prenatal feeding intentions. If I had approached only women who were listed on the midwives' book as breastfeeding, then the perspectives and experiences of mothers who had already discontinued breastfeeding would not have been documented.

Although the literature includes debates regarding the minimum age at which individuals can ethically provide informed consent to research (Geluda et al., 2005), I set an inclusion criterion as an age of at least eighteen to avoid any question of the necessity for third party consent. Potential participants also had to express adequate comprehension of verbal and

written English before I accepted their agreement to participate in the study. This limitation was due to the infeasibility of employing an interpreter due to the expense and the unpredictable, frequent contact I had with the various participants. This flexible timing in the conduct of the study was due to visiting hours, medical care of participants and maternal preferences regarding the timing of the interviews. I intended to deal with special communication needs (such as hearing impairment) on a case-by-case basis, but the need did not arise.

The only explicit exclusion criterion for this initial interview study was if hospital staff advised against the participation of a particular woman in their care. I intended to record the reason/s why the midwives recommended exclusion, but this did not occur.

Phase 1 preparation to conduct research

Interviewer training is important so that research conduct conveys professionalism to participants and for the researcher to be prepared for adhering to the study protocol under varying conditions (Bryman, 2008). Before the initial interview phase was initiated, I practiced the semi-structured questions with Professor Ball. We confirmed that I could be self-assured when introducing the research, achieve an appropriate level of rapport and follow up on ambiguous or particularly interesting participant responses.

Criteria of a successful interviewer also include being sensitive, clear and gentle (Kvale, 1996, in Bryman, 2008), which I consciously tried to convey throughout the conduct of the interviews. One's views of caesarean section delivery are influenced by personal feelings/experience as well as thoughts on how it is interpreted by others. A 'too posh to push' label is prominent in the British media regarding women who undergo caesarean section (see BBC, 2007). I was conscious to be and to be perceived by families as non-judgmental regarding their childbirth choices and experiences.

To appropriately conceptualise the mother's interview responses, I immersed myself in the postnatal ward environment before initiating the research. My volunteer activities mainly comprised assisting midwives in moving beds and eating alongside them in the staff lounge. There is a shortage of midwives throughout the NHS and the lack of appropriate staffing levels has been associated with adverse events and low uptake of training opportunities (Ashcroft et al., 2003). The stress resulting from RVI midwives wanting to look after the women and their babies but being stretched among many families was apparent.

Phase 1 recruitment of participants

I recruited participants from February to April 2006 on the Royal Victoria Infirmary Ward 32. This is where women are cared for after relatively complicated deliveries such as forceps, ventouse (vacuum extraction) or a caesarean section. Upon arrival to the ward, I reviewed the midwives' notebook that listed the mothers on the ward and a summary of their obstetric information. In consultation with the midwives, I considered potential participants by whether a woman had a caesarean section and if she had been in the hospital for at least one night after the delivery. I did not read about birth complications, feeding behaviour or the type of caesarean so as not to bias recruitment. Each day before I talked to any mothers, I liaised with the midwives on duty to confirm the appropriateness of approaching the women on the ward.

I opportunistically approached women because this recruitment method was time efficient for me and caused little disruption on the postnatal ward. Opportunistic or 'convenience' sampling involves selection on a first-come basis within a predefined population (Bryman, 2008). New mothers are only partly accessible while they are in the hospital because their

time is generally occupied by resting, partaking in infant care, engaged with visitors and/or undergoing medical checks. I approached women whenever they were free instead of waiting for women with particular characteristics to become available, as in quota sampling. Quota sampling might have also introduced bias to my recruitment, thereby limiting the inferences I could draw from the data (Mendenhall, Beaver, and Beaver, 2009). Opportunistic sampling leads to data that can generate new hypotheses (Bryman, 2008), so this is a valid approach for the purpose of exploring breastfeeding issues after a caesarean section.

I knocked and slowly walked past a woman's bedside curtain when I anticipated that no medical professionals were present and that the woman was awake. I identified myself[1] and verbally explained that my association with the hospital was having chosen it as the study location and that I had a project collaborator, Dr. Ward-Platt. The fact that I was a student from another institution who was conducting the research for an academic qualification and would anonymously feed the results back to the hospital minimised a potential source of bias in enrolment and in the interview responses. Lumley (1985) discussed participant reluctance to reveal opinions of hospital care where the interviewer is a member of staff.

After the introduction, I verbally explained that the purpose of the study was to investigate infant care after a caesarean section. If a mother was not interested in hearing details, I thanked her for taking the time to consider the research and then I left. In a covered portfolio, I made a note of the mother's first name and bed number to make sure that I would not approach her again. If a mother expressed interest, I provided copies of the Participant Information Sheet (Appendix A, p. 222) and Consent Form (Appendix A, p. 225) to her and gave copies of the documents to her visitors when applicable.[2]

If the woman expressed the desire to have more time to consider the interview or if she was hesitant in volunteering, I left the room to allow her to decide and returned to the woman's bedside after about ten minutes.

Phase 1 maternal informed consent and enrolment

After a woman verbally agreed to participate, she completed the Consent Form. The purpose of obtaining informed consent from participants was to confirm that the woman understood the research and to confirm an appropriate relationship between us, as a respectful researcher and a willing participant. The participant initialed next to numbered points confirming that she understood: the study purpose, the voluntary nature of taking part, that I would access medical notes to document obstetric information and that she was welcome to inform anyone of her participation. Past human subjects have been abused in the name of research, so protection for participants has been institutionalised in governing bodies and research documents (Nuremberg Code, 1949; Fathalla and Fathalla, 2004). Clear information and genuine rapport is also important because confidence among potential participants regarding communication of and perceptions about the research has been found to affect enrolment decisions (Molyneux, Peshu, and Marsh, 2005).

After the woman signed and dated at the bottom of the sheet, I also signed it. In addition to confirming that I would abide by the outlined research, my signature was a sign of my intent to conduct all aspects of the project with integrity. As discussed by Miller and Boulton (2007), the meaning of informed consent now includes a confirmation that the

[1] I identified myself as a doctoral student in Biological Anthropology at Durham University. My NHS badge featured my photograph and my RVI 'Research Associate' status.

[2] The design, content and readability of the paperwork were based on the NHS Central Office for Research Ethics (COREC) guidelines (2005).

researcher is operating by ethical motives to guide the unique situations that inevitably arise when working with human subjects.

Once the Consent Form was completed, I enrolled each woman into the study by allocating her a numerical code. This reference number was written on her Consent Form and Interview sheets.

Phase 1 data collection

Interviews were conducted while I sat on the participant's sole chair, sometimes instead of the infant's father, or on an edge of the woman's bed. Ward 32 rooms that accommodated multiple people have ceiling to knee-high curtains that serve as a partition. The curtains are opaque and hang from rods mounted on the ceiling. When a curtain was pulled closed it laid against the furniture and the neighbour's adjacent curtain. It always felt very warm on the ward and those situated next to a window frequently had it propped open.

I looked at the participant as I asked the questions, and wrote down her responses after listening to the reply. When a midwife or paediatrician came in to check on the mother or infant, I halted our discussion. In these circumstances, I either left the room or remained quiet reading my notes until the medical professional departed. On other occasions, interviews were cut short due to participants' visitors. When possible, the interviews were resumed later in the day. If a mother was concerned about time because of the imminent arrival of visitors and wanted her participation to cease upon their arrival, I prioritised the feeding-related questions.

I intended to conduct all interviews with participants without the presence of visitors to control for them potentially influencing maternal responses. However, the visitation timetable and pace of the postnatal ward necessitated interviews be conducted at times most convenient to each woman. This frequently occurred when others were at her bedside. Comments by or deriving from people other than the mother were noted separately on the interview sheet from those originating from the participant.

Anthropological fieldwork traditionally occurred among participants and researchers who do not speak the same first languages (Ferraro, Trevathan, and Levy, 1994). This was not the case for my project, as all of the participants resided in the northeast of England and were primarily British. Language issues were relevant only to the extent of the minor discrepancy between the majority of participants' local 'Geordie' dialect compared to my Midwestern American English.

Audio recording of interviews is advisable to ensure the validity of qualitative research, but I did not use a tape recorder in the conduct of interviews for multiple reasons. The use of the recorder may have led me to ask questions at a more rapid pace. A regular conversational speed would have reduced the time that participants had to consider the topics. The pauses that were incurred by me writing the responses permitted women to think about what they had said and often led to expansion. Secondly, audio recording was not adopted because participants were frequently engaged in infant caretaking while talking. Their movements coupled with the postnatal ward background noise would have likely led to inaudible segments when played back. Finally, the interviews were conducted on the postnatal ward, which was only semi-private, so non-participants might have been unwittingly recorded.

The lack of an audio record of the interviews limits the results because some discrepancies may have occurred between participant responses and what I wrote as their replies. However, I felt that the potential for this error was minimal. I immediately sought

clarification when in doubt of what the woman had said or meant. I also made notes on the interview schedule after discussions were completed to record any additional conversations or relevant behaviours that occurred as I was packing up my materials from the participants' bedsides. Subtle speech mannerisms would have been apparent through verbatim analysis of recorded interviews, but this data was not vital to address the study objectives. Additionally, transcription errors resulting from mishearing or misinterpreting words occur as well (Easton, McComish, and Greenberg, 2000; MacLean, Meyer, and Estable, 2007).

I obtained interview data by means of supportive listening, as described by Dickson-Swift and colleagues (2007). I made eye contact with participants as I asked questions, developed rapport and displayed my understanding of their remarks by writing down their words and then moving on. The interviews were conducted in a relaxed manner and any participant-led deviation from listed topics was acceptable.

Immediately upon completion of the postnatal ward interview, mothers who met the additional inclusion criteria of having delivered a single infant of 37 weeks or more gestation and intended to continue breastfeeding after hospital discharge were invited to participate in telephone follow up. The objective was to document factors that influence the duration of their breastfeeding, so those who definitely planned to exclusively use formula were excluded. The research was divided into two parts in this manner so that I could identify potential participants in the course of the postnatal ward interview. I presented potential follow-up participants with an additional Participant Information Sheet (Appendix B, p. 231) and Consent Form (Appendix B, p. 234) for that component of the research. I telephoned those who consented at two, four, six, eight, twelve, sixteen, twenty and twenty-four weeks post-hospital discharge.

Phase 2

Phase 2 sample size calculation

Sample size calculation for experimental research is based on statistical variables to ensure that enough data are obtained to either reject or support a null hypothesis. My null hypothesis, H_O, was that observed breastfeeding frequency in the side-car crib group would be no different compared to the standalone cot group (refer to p. 31). Since there is always the possibility that data will transpire a certain way simply by chance, trials are designed to include a certain number of participants to minimise this distortion of intervention effects by random deviations or naturally occurring variation (Devane, Begley, and Clarke, 2004). Research validity necessitates the lower bound of sample size requirements while the principle of beneficence,[1] time limitations and funding constraints curtail the upper bound. Scientific inquiry must be balanced with the interests of the participants, researchers and future beneficiaries (Hoeyer, Dahlager, and Lynöe, 2005).

I used power calculations for the randomised trial phase of the research in order to estimate the number of participants required to determine if breastfeeding behaviour was truly different among the groups of maternal-infant dyads. This type of randomised trial in which the sample size is set in advance of the research being conducted is referred to as a fixed-sample trial (Jadad and Enkin, 2007). I predetermined the number of participants instead of using the sequential trial design in which participants are continually recruited until data analysis exposes a particular statistical significance level between group differences or the lack thereof (Jadad and Enkin, 2007). Researchers are not meant to

[1] Beneficence, in this context, refers to the ethical obligation minimising potential harm to the (few) participants while undertaking research to support the (many) potential beneficiaries. Kotch (1997) defines beneficence in maternal and child health research as "the principle that the research should benefit the actors involved, especially parents and children, but also society as a whole, at the same time it adds to our scientific knowledge" (p. 387).

analyse data while the trial is ongoing because they could manipulate the number of participants to better fit with expected outcomes. I adopted the fixed-sample size approach in order to objectively test the intervention efficacy and to gauge the magnitude of the breastfeeding impact between the two study arms to the greatest extent possible.[1]

Group outcome measures in fixed-sample size trials can range from no difference to a high probability of an effect. In comparison, sequential trials are halted once the variables reach a predetermined significance level. The conventional threshold that experimenters set before conducting the research is a significance level (alpha) of 0.05 (Cunningham and McCrum-Gardner, 2007). If the difference in median observed breastfeeding frequency per hour between the two arms of my project had an observed significance level (p-value) of 0.05, it would represent that there was a 5% chance of the behaviour occurring by chance (as long as confounding variables were evenly distributed between the groups). A sequential trial design would not have allowed for the possibility of a higher probability value. In summary, I chose a fixed-sample size to precisely document the strength of the relationship. The variables that I used in the power calculation are presented in Table 3.2.

Table 3.2: Phase 2 sample size calculation parameters.

The Ph. 2.sample size was determined by:	
- expected value of standalone cot group	0.5 breastfeeding sessions/ hour
- expected value of side-car crib group	1.5 breastfeeding sessions/ hour
- standard deviation (sigma)	1.5
- significance level (alpha)	0.05
- power (1 – beta)	1 – 0.20 = 0.80

The expected values, effect size, standard deviation and power are described below. Consistent with Vitzthum (1989), I distinguished between breastfeeding episodes (each time the infant was on/off the breast) and breastfeeding sessions (feeding episodes separated by a certain time interval).[2] Breastfeeding sessions were the unit of measurement I used for determining breastfeeding frequency. I defined breastfeeding sessions as the infant being off of the breast at least five minutes, as applied by McKenna, Mosko and Richard (1997).[3] Ball and colleagues (2006) did not publish their breastfeeding definition, but classed the sessions by approximately ten-minute intervals (H. Ball, personal communication, June 2006).

Type I error and type II error

Rejecting the null hypothesis when it is actually true is a 'type 1' error. Research balances the likelihood of this false positive with the possibility of a false negative 'type II' error. The type II error may occur when alpha is set at a stricter threshold, such as the significance level of 0.01. In that case, there is only a 1% chance of rejecting the null hypothesis when it is true, but there is a greater risk of failing to reject the null hypothesis when an alternative hypothesis is true.

In Phase 2, a type I error would mean that I concluded that the cot types were associated with differential breastfeeding behaviour when in fact they were not. In contrast, a type II error would involve me determining that random allocation of the side-car crib was not associated with differential breastfeeding behaviour when in reality it was.

[1] The total number of participants required in a fixed-sample size is estimation because some of the parameters in the power calculation are based on assumptions.

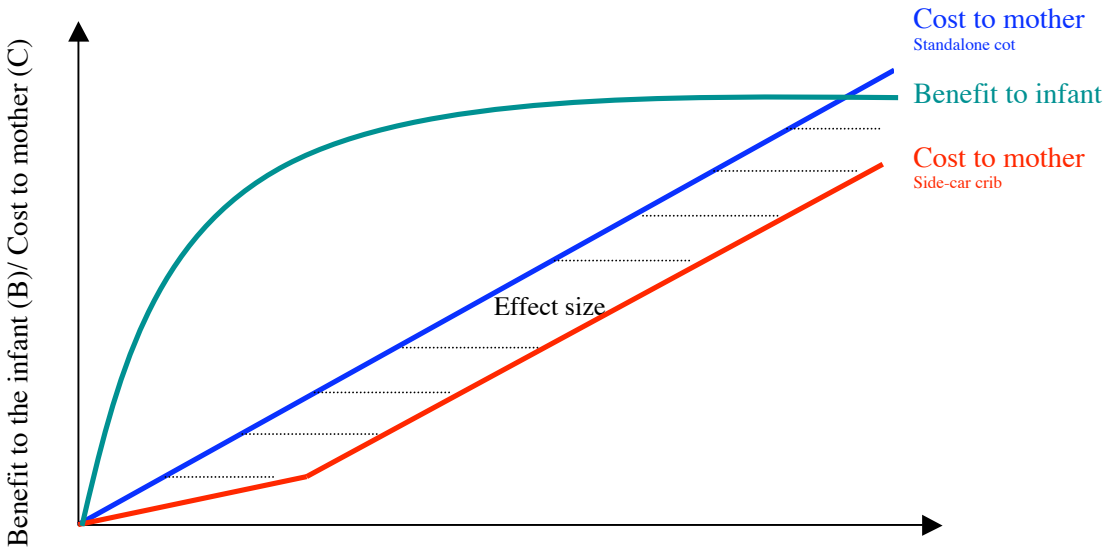
[2] My full behavioural taxonomy is described on pages 58-59.

[3] McKenna, Mosko and Richard (1997) used the five-minute criterion as their unit of measurement for breastfeeding frequency, but they refer to feeding both within the interval and as separated by the interval as 'episodes.'

Effect size and power

Effect size factors into the sample size calculation because it is a measure of the strength of the independent variable on the dependent variable (Devane, Begley, and Clarke, 2004). The difference between the two cost lines, Cost to $\text{mother}_{\text{Standalone cot}}$ − Cost to $\text{mother}_{\text{Side-car crib}}$, in Graph 3.1 illustrate an effect size on the maternal cost of breastfeeding investment.

Graph 3.1: The predicted effect size of the side-car crib allocation on the cost for the mother to breastfeed at a certain point in time compared to the standalone cot.



To predict the effect size among my participants, I based the expected 'population' breastfeeding frequency on the existing literature. Power calculations are utilised so that a difference in sample means can be inferred as indicating a difference in population means (Mendenhall, Beaver, and Beaver, 2009). Previous research has not adequately documented frequency of breastfeeding sessions on the postnatal ward after a caesarean section delivery.[1] Therefore, I based my estimation on the findings of Ball and colleagues (2006) because their study was conducted with similar methods.[2] I predicted an average of 1.5 observed breastfeeding sessions per hour with the side-car crib group and 0.5 among the standalone cot participants.

The 'power' of a test is calculated from the probability of a type II error (beta) subtracted from one (Cunningham and McCrum-Gardner, 2007). The minimum probability acceptable for a type II error in clinical trials is 20% (Devane, Begley, and Clarke, 2004). This means there is a 1 in 5 chance of attributing no effect to the intervention when one actually exists.[3] In calculating my sample size, I followed this routinely employed research protocol because although I wanted the research to be as rigorous and valid as possible, a stricter significance level and greater statistical sensitivity correlates with larger samples given a particular effect size. I solely conducted all stages of the research within a defined

[1] See Appendix F, p. 255, for an overview of two studies, Nissen and colleagues (1996) and Chen and colleagues (1998) that documented breastfeeding frequency after a caesarean section, but the data are unusable for my power calculation due to various methodological issues.

[2] Ball and colleagues (2006) found a median and range of postnatal ward overnight breastfeeding sessions frequency per hour of frequency per hour among mother-infant dyads after vaginal delivery of 1.3 (0.0 – 7.3) among those randomly allocated the side-car crib and 0.5 (0.0 – 6.6) with the standalone cot group. The mean difference between the groups in breastfeeding sessions per hour was 0.96 (0.18 – 1.73). The median breastfeeding effort (successful + attempted feeds) was 3.4 (0.0 – 14.3) side-car crib and 1.3 (0.0 – 12.9) standalone cot, with a mean group difference of 2.52 (0.87 – 4.17).

[3] The 0.20 threshold for a type II error is more lenient than the 0.05 p-value for type I errors. The difference commonly employed is attributed to conservatism in asserting that experimental practices are better than existing ones (Devane, Begley, and Clarke, 2004).

time period, so I felt that basing the sample size estimation on the accepted minimum level for type II error was appropriate. My calculation of the power was 1- 0.20 = 0.80.

A standardised difference relates to the dispersion of measured variables; the statistic describes how far data points occur from the mean (Mendenhall, Beaver, and Beaver, 2009). Trials aim to detect at least 0.5 standardised difference between groups with continuous variables (Torgerson, 2006). My population standard deviation was unknown, so I estimated it based on data from Ball and colleagues (2006). The best method of approximation is the range of the least and greatest measurements divided by 4 (Mendenhall, Beaver, and Beaver, 2009). The data on median breastfeeding sessions per hour among vaginally delivered mother-newborn dyads ranged from 0 to 7.3. My standard deviation approximation calculation was therefore 7.3/ 4 = 1.825. I rounded the estimated standard deviation down to 1.5 because I predicted that there would be less of a range in breastfeeding frequency among my participants. Ball and colleagues (2006) did not report if any of their participants had discontinued breastfeeding before the observation period and I anticipated that this might occur after a scheduled caesarean section.

I employed a one-sided test in the power calculations due to my prediction that there would be a direction in the effect of the side-car crib on breastfeeding. I entered the values into an online sample size calculation programme (R. Brant, Accessed June 2006 at http://www.stat.ubc.ca/~rollin/stats/ssize/n2.html). Each group required 28 participants to achieve 80% power with an alpha level of 0.05 and a sigma of 1.5. I therefore aimed to obtain data on 56 mother-newborn pairs.[1]

Phase 2 inclusion and exclusion criteria

The inclusion criteria are outlined on the Letter of Invitation (Appendix C, p. 235) and Participant Information Sheet (Appendix C, p. 236). They specify that mothers must be pregnant with a single infant, expecting to deliver after at least 37 weeks gestation, non-smokers during pregnancy, at least 18 years of age, scheduled to deliver by caesarean section at the Royal Victoria Infirmary and considering breastfeeding. The additional criterion of planning to spend the entire postnatal ward stay at the RVI was added after it emerged that some women opt to transfer to smaller hospitals more local to their homes after the first postpartum night. Dy, Rubin and Lehmann (2005) found that inter-hospital transfer requests are often triggered by patient dissatisfaction with current care. Numerous women explained to me that other postnatal wards provided private rooms that were lacking at the RVI.

Women pregnant with multiple foetuses were not eligible to take part because of practical limitations of side-car crib use (two side-cars would have impeded mothers from leaving the bed). Additionally, caregiving for two or more newborns would not have been directly comparable to that for a single infant. I instituted the eligibility criterion of full-term infants ($\geq$ 37 weeks gestation as defined by Hamilton, Martin, and Ventura, 2009) because premature birth is associated with the greater rates of morbidity experienced in lower birth weight infants (Eichenwald and Stark, 2008; McIntire et al., 1999).

Maternal smoking status during pregnancy was an important consideration because nicotine consumption is associated with intrauterine foetal growth retardation. This leads to smaller and lower birth weight infants than those born to non-smokers (Kirchengast and Hartmann, 2003). Additionally, infants who were exposed to tobacco as foetuses behave differently than infants born to women who did not smoke in pregnancy. Chang and colleagues (2003)

[1] Thirty-nine participants would have been required in each group to achieve 90% power at a significance level of 5% with a standard deviation or 'sigma' of 1.5.

found that smoke-exposed infants aged 8-12 weeks were less rousable during non-rapid eye movement sleep in a controlled environment than those not exposed to smoke. Data also suggest that infants sleep for shorter bouts and spend less time in each stage of sleep after breastfeeding soon after their mother smoked compared to when their mother had refrained from smoking (Menella, Yourshaw and Morgan, 2007). Altered infant physiology and development associated with the carcinogenic components in cigarettes (Ginzel et al., 2007) is a major risk factor for Sudden Infant Death Syndrome (Fleming and Blair, 2007). Excluding newborns whose developmental state was likely impaired permitted more accurate comparisons of the effect of the cots on infant feeding.

Participants must have been at least eighteen years of age to ensure the appropriateness of women providing their own informed consent, consistent with Phase 1 (refer to p. 40).

I ascertained breastfeeding intentions of potential participants by listing "you are considering breastfeeding your baby" among the other bullet-pointed inclusion criteria on the Letter of Invitation (Appendix C, p. 235). I phrased this in a manner so as not to deter women who did not have previous breastfeeding experience or strong feelings for this infant feeding method. Parity and breastfeeding experience were not eligibility factors, but these and other participant characteristics were collected through participant medical notes and via the semi-structured interviews.

Ideally, the trial would have included women who underwent unscheduled caesarean section in addition to scheduled caesarean section delivery. However, I was concerned about obtaining informed consent among labouring women. Recruiting women who were about to undergo unscheduled caesarean would have involved unpredictable timing and possibly added stress to families in a vulnerable condition. I did not explore the possibility of midwives enrolling unscheduled caesarean section women because it is best for research recruiters to be directly involved in the project. Intimate knowledge of the research contributes to potential participants being provided accurate information about the study and minimises inadvertent pressure on families to volunteer to please their caregivers (Cooke, 2005). The most appropriate procedure to include women who had an unexpected caesarean section in this type of study would be to prenatally recruit those anticipating vaginal delivery. I did not proceed with this strategy because it would have entailed a much larger sample size, greater finances and more time. Additionally, a sample that included vaginal and both types of caesarean section deliveries would have been much more heterogeneous than the one I obtained due to the differing lengths of labour, medical conditions, anaesthesia, maternal sleep and other factors that may affect early breastfeeding.

Exclusion criteria included women whose midwives had advised against participation, as was the Phase 1 protocol (refer to p. 41). This occurred once when I was advised not to attempt to recruit an HIV-positive woman.[1]

Factors that rendered a participant ineligible after enrolment were: not meeting any of the inclusion criteria, mother or infant being unwell or the dyad not having a scheduled caesarean section (due to spontaneous onset of labour). The strict adherence to specified inclusion/exclusion criteria limits generalisability of the results but ensured internal consistency and thereby enabled a valid test of efficacy (Torgerson, 2006).

[1] Breastfeeding is contraindicated with this medical condition when replacement infant feeding substances are 'acceptable, feasible, affordable, sustainable and safe' due to the risk of mother-to-child transmission (WHO, 2003).

Phase 2 preparation to conduct research

My being on the ward during Phase 1 led to informal discussions with obstetricians, midwives and paediatricians. Midwives lamented the low level of staffing, especially with regards to night shifts. The medical professionals were not formally interviewed because the research sought to explore mothers' experiences of breastfeeding after a caesarean section.

Being present among the postnatal ward staff on a daily basis and spending a great amount of time at the midwives' station while noting participant medical information led to a realisation of the variations in postpartum support that occur in practice. This distinguishing between what the hospital guidelines stated and what was actually done is a benefit of having an extended presence. The results of some midwifery actions that I witnessed concerning breastfeeding support are presented in Chapter 6.

Additionally, I learned about caesarean sections from a RVI surgeon who honoured my request to observe a caesarean section delivery. He first explained the procedure to me by going over images in a medical textbook and by drawing diagrams of the operation. I then sought verbal informed consent from a woman who was pregnant with twins and from her surgeon to be present in the operating theatre during the caesarean section delivery. I explained that witnessing the birth would improve my understanding of women's experiences, as I do not have children. After obtaining approval, I dressed in hospital scrubs and was present for all stages of the procedure: the woman entered the operating theatre, spinal anaesthesia was administered, the effectiveness of the anaesthesia was tested via cold air on the mother's abdomen, the father entered the room dressed in scrubs and took a place on a stool next to his partner's head, some of the nurses documented the proceedings and others monitored the woman's vital signs. During all of the events, I was on the 'medical' side of the sheet draped over the woman's abdomen that separated the parents from the caesarean section procedure. My surgeon-informant stood next to me and narrated the operation throughout the various stages of the infants' births. As expected, the experience was very clinical and seemingly rough on the woman's body. I witnessed the sex of the infants before they were announced and saw the newborns' first breaths before they were checked over and then given to their parents. The birth took only a few minutes, but I later had to excuse myself during the stitching of the incision layers because I became light-headed during the lengthy process. I also attempted to witness a vaginal birth for comparison to the caesarean section delivery, but the midwives' request to a labouring woman was declined.

Phase 2 recruitment of participants

I predicted my rate of recruitment based on an average number of ten scheduled caesarean section deliveries per week that I observed during the first phase of the research. Phase 1 data indicated that over half of these women could be anticipated to be considering breastfeeding. I estimated that opportunistic recruitment would yield one to three participants per week. I recruited participants for this phase of the research by the three approaches, as outlined in Table 3.3.

Table 3.3: Recruitment of Phase 2 participants.

	Information distribution	Enrolment procedure
1. RVI antenatal ward secretary[1]	Upon booking the date of a caesarean section, the woman was provided with my Letter of Invitation, Participant Information Sheet and Consent Form by the antenatal ward secretary (Appendix C, pp. 235-240)	A woman could post her completed Consent Form to the Durham Sleep Laboratory via a freepost envelope
2. RVI antenatal ward maternity assessment appointments	At a woman's final RVI appointment before undergoing a caesarean section within the next week, I discussed the research with her face-to-face at the maternity assessment unit	A woman could: hand me her completed the Consent Form at the maternity assessment unit; return it to the Durham Sleep Laboratory via a freepost envelope
3. Supplement through NECOT	To obtain additional participants after December 2007, I sent a tailored Letter of Invitation, Participant Information Sheet and Consent Form to women who were already enrolled in another RVI study with the Durham Sleep Laboratory (Appendix D, pp. 246-250)	A woman could post her completed Consent Form to the Durham Sleep Laboratory via a freepost envelope

After obtaining approval from the RVI antenatal manager, I provided research information packets to the ward's secretary. The Letter of Invitation, Participant Information Sheet and Consent Form were secured together. The antenatal secretary handed the packets out to women when she met with them to book their caesarean section delivery dates. She did not enquire about woman's eligibility criteria nor did she describe the research. The secretary simply stated that I was conducting a study and gave the information to women. This method provided potential participants with all of the study details in as far in advance of their scheduled caesarean sections as possible. The Letter of Invitation and Participant Information Sheet contained my contact details so that women could inquire about the study or to express their willingness to take part. A freepost envelope was also provided in the research packet so that a woman could enrol by posting her Consent Form to me at the Durham Sleep Laboratory.

I later saw the women who had received the information from the antenatal secretary at their final RVI appointments before their caesarean sections. On Wednesdays from January to December 2007, I attended these appointments for women who were scheduled to have a caesarean the following week. Starting from 9 a.m. and lasting until about 2 p.m., the midwives would go over the details of the surgery preparation with a woman and her family in a large and open, fluorescent-lit room. Upon arrival, women were directed to set their belongings at a chair and come over to be weighed and measured next to the midwives' station. A midwifery student would take and dictate the measurements to the principal midwife and then the woman would go back to her waiting area. Then the midwives went over instructions that the women were to follow in preparation of their operative delivery.

[1] I initially attempted to recruit participants at the time of their caesarean section booking to maximise the time that women had to consider participation. The appointments for a caesarean section delivery are made between thirty-two to forty-one weeks gestation, according to the factors underlying each surgery. However, the antenatal bookings occur throughout the week during business hours. After a week of attempting to recruit in this manner, it was clear that it was inefficient for me to work in an office and be summoned by the ward secretary once or twice a day. Additionally, the caesarean section delivery was unexpectedly just decided for some women who therefore would benefit from time to reflect upon their upcoming birth experience before being asked to take part in research about their experience. Providing the study information through the antenatal secretary provided women with the research details unobtrusively while still permitting the greatest amount of time possible to consider enrolment.

I sat in a chair reading a book or writing notes while the midwives were busy. After the appointments were completed, they would inform women and their families that research was being conducted and that I was there to explain the project. If women agreed to be approached, I would pull my chair across the room to be positioned directly next to them to quietly discuss the research. I introduced the project as a study to see which hospital cot type was preferred by women who had a caesarean and to see what, if any, difference in mother-infant behaviour occurs among groups of people using the cots. After this general introduction, I confirmed that they were willing to hear further details. If the woman was interested, I provided her, and when applicable her family members, with copies of the Letter of Invitation (Appendix C, p. 235). The document gave a brief description of the trial and listed all of the inclusion criteria together via bullet points. I chose to group the inclusion criteria together to avoid drawing attention to the research interest in breastfeeding and also so as not to directly ask women's infant feeding intentions. The Baby Friendly Hospital Initiative recommends that women not be prenatally asked their planned infant feeding method (UNICEF UK, 2008). Instead, midwives provide infant feeding information to all pregnant women and do not solicit their plans.[1]

At the end of my original recruitment period, December 2007, there was an imbalance in the number of usable videotapes obtained between the standalone cot and side-car crib groups. There were 10 usable observation tapes in the control group compared to 20 in the intervention group. This discrepancy was due to participant disqualifications, technical difficulties with filming and participant withdrawals. The recruitment details are presented in Chapter 4. The disparity had to be addressed for statistical analyses to be valid. Therefore, I extended the duration of recruitment for the standalone cot group.

Although the side-car crib videotapes total of 20 participants was below the 28 tape sample size that I had powered, clinical trials often fail to achieve their target for completed data (Campbell et al., 2007; Torgerson, 2006). In order to permit me the time to begin writing up the introduction, literature review and this section of the thesis, I did not recruit to supplement the side-car group. Previous night-time parenting studies have similar sample sizes with teams conducting the research: Ball and colleagues (2006) obtained data on 18 bedsharing, 23 side-car crib and 20 standalone cot dyads while McKenna, Mosko and Richard (1997) had 20 routinely bedsharing and 15 routinely solitary sleeping mother-infant pairs. Falling short of my powered sample size limits the conclusions that can be drawn because the inferences are not as statistically reliable as they would be had I achieved the target sample size.

My original recruitment protocol could not be continued due the initiation of other research on Ward 32 in January 2008. However, the overlapping project was the Northeast Cot Trial (NECOT), conducted by Ball and colleagues. NECOT is a randomised controlled trial that documented the impact of the standalone cot control or side-car crib intervention on the breastfeeding duration of over 1,000 participants. The study is similar to Ball and colleagues' previous trial (2006) and my research, but NECOT did not involve filming and the outcome measure is breastfeeding after hospital discharge. Inclusion criteria for NECOT were women pregnant with a single baby, non-smokers during pregnancy and considering breastfeeding. Planned delivery mode was not a NECOT criterion, so my target population of women planning a caesarean section was included in the NECOT project. The timing, design and participants in the NECOT study enabled me to collaborate with those researchers to recruit a subset of their participants to enhance my video sample.

[1] The rationale of the protocol is that it enables midwives to discuss the benefits/risks of the breast and artificial feeding since the absence of a stated decision from the mother avoids closing off infant feeding method conversations.

I obtained ethical approval from the Newcastle and North Tyneside REC 1 and the County Durham and Tees Valley REC 2 to extend my research until up to 15 additional videos had been obtained through recruitment within the Northeast Cot Trial (NECOT). Between October 2008 and March 2009, I identified potential participants from a NECOT spreadsheet that listed participant details. I checked for women who scheduled a caesarean section, were allocated the standalone cot, and who indicated that she was willing to hear about further research by ticking a box to that effect on the NECOT enrolment form. My previous recruitment methods of antenatal clinic information packets coupled with face-to-face discussions at the maternity assessment unit were not viable because potential participants would have already been approached by the NECOT researchers. The NECOT study records only the names of women who are enrolled, so it would have been inappropriate for me to ask a woman to consider research that involved more extensive participation (filming) than the NECOT study protocol that she may have declined.

Northeast Cot Trial participants were enrolled at ultrasound scans at 20 weeks gestation and then randomly allocated their postnatal ward cot types at 35 weeks gestation. Upon the randomisation of participants who were eligible to participate in my extension, I posted them updated versions of my Letter of Invitation, Participant Information Sheet and Consent Form (Appendix D, pp. 246-250). These women had the opportunity to opt in to my filming study by returning the completed Consent Form to the Sleep Laboratory via a freepost envelope that I provided in their information packet. Apart from this modification to the method of recruitment, no other alterations were made to my study protocol. No additional information was required from participants. They continued with their involvement in the NECOT trial as normal.

Phase 2 maternal informed consent and enrolment

A woman could enrol by returning a completed Consent Form and then I assigned her a numerical code. This reference number that appeared on the interview sheet and videotape ensured anonymity for the participant and safeguarded my analysis of the data from being biased from my knowing which cot type the participant received.

Once enrolment had begun, I amended the recruitment protocol because I realised that multiple women had misrepresented their eligibility and been inappropriately enrolled. In the course of interviewing participants on the postnatal ward, some women said that they had always intended to bottle-feed breast milk substitutes. To prevent this enrolment error from recurring, when potential participants said or nodded that they met all of the inclusion criteria I confirmed they were in fact thinking about breastfeeding. On numerous occasions, the woman or her partner said that she actually intending to only use formula. These instances represent inadequate comprehension of the inclusion criteria or intentional manipulation from women because of perceived benefits of taking part in the study.

Random allocation of postnatal ward cot types

The control and intervention cot type allocation ratio was one to one; all participants had the same chance of receiving the standalone cot or the side-car crib. To randomise the allocation, I provided the participant numbers to Professor Ball. She used an online random number generator to allocate cot groups (0 = standalone and 1 = side-car) to the numerical codes. The procedure of having the cot allocation concealed from me was often helpful in my recruitment discussions with potential participants. I was able to honestly explain to the women and their families that I empathised with their expressed preference for a particular cot type, but could not influence the allocation. If I had allocated the cot types in line with participant preference, I could not have separated observed maternal-infant interactions when using the cots from participants' baseline characteristics. Allocation concealment also ensured that breastfeeding outcomes were not biased by

manipulation. The results of randomised trials that involve faulty allocation damage health policy because bias in the statistical analysis and subsequent interpretation of the data are not taken into account (Torgerson and Roberts, 1999).

In order to prevent me from guessing the cot type that any particular potential participant might be allocated, I did not use restricted or stratified randomisation. If women had been randomised in a series of blocks (for every certain number of participants a particular amount are allocated one treatment and the rest receive the other condition) through restricted randomisation, I might have remembered previous allocations and guessed the next (Torgerson and Roberts, 1999). Similarly, stratified randomisation could have led to a temptation to manipulate groups because I would have had to decide which of various predefined demographics would take precedence when attempting to balance the characteristics of individuals in the two arms of the trial (Altman and Bland, 1999). The drawback of using simple randomisation was that the number of participants allocated to the control and intervention groups was determined by chance and so not identical.

I communicated the cot allocation to the participants by telephone and to midwives by electronic mail to the Ward 32 manager. The midwifery manager distributed the information to the appropriate staff so that delivery suite and postnatal ward midwives knew who was taking part and which participants should have the side-car cribs. The cribs were stored in a closet on the postnatal ward and the midwives were meant to secure them on to the appropriate maternity beds by the first postpartum night. I telephoned the postnatal ward to confirm with the midwifery manager that participants had delivered and received the appropriate cot type. Although Prof. Ball, Dr. Ward-Platt and I had confirmed the midwives were willing to secure the side-car cribs before the project initiation, I travelled to the RVI to attach the side-car cribs myself when necessary.

Randomised controlled trials with human subjects fail to enrol a high proportion of eligible participants due to individuals' preference for the intervention or control allocation. During my recruitment period, various potential participants expressed concern regarding side-car crib safety, some were worried the baby 'would think he was bedsharing' and while others definitely wanted to have a side-car but were put off the 50% chance of not receiving it.

Trial designs that attempt to overcome this type of enrolment limitation by including non-randomised participants or complying with people's allocation preferences are 'Zelen,' 'comprehensive' and 'Wennberg.'[1] Although more eligible participants would have been included in the research had I adopted one of these trial types, that potential benefit was outweighed by my concerns about informed consent (Cooke, 2005). The idea of including individuals in research without their knowledge in order to protect them from disappointment is objectionable (Snowdon, Elbourne, and Garcia, 1999). This enrolment method was not feasible anyway, since the main outcome measure, breastfeeding frequency over the second postpartum night, was measured through filming.

The drawback to my 'open' trial that analysed only those who consented to take part was the risk of resentful demoralisation among participants (Torgerson, 2006). Women who enrolled with the hope of receiving the intervention may have been disappointed when they

[1] Jadad and Enkin (2007) describe these trial types that deviate from informed consent, random allocation and follow up of the enrolled participants. Zelen trials involve randomising people before they consent to enrol in the study and not informing those allocated the standard treatment. A comprehensive trial design means that those who agree to randomisation receive one of the conditions while those who refuse to participate in the randomisation process are allocated their choice of condition. Then, the outcomes of the randomised groups and the cohort of those who received their preference are compared. In a Wennberg trial design, people consent to random allocation of being in a randomised group or a preference group.

were allocated the standalone cot. This is a concern from a research point of view because their dissatisfaction could lead to less willingness to complete the interviews or filming. To minimise this possibility, during recruitment I emphasised the altruistic benefit of taking part in the research whichever cot type was received (Williams et al., 2008).

Phase 2 data collection

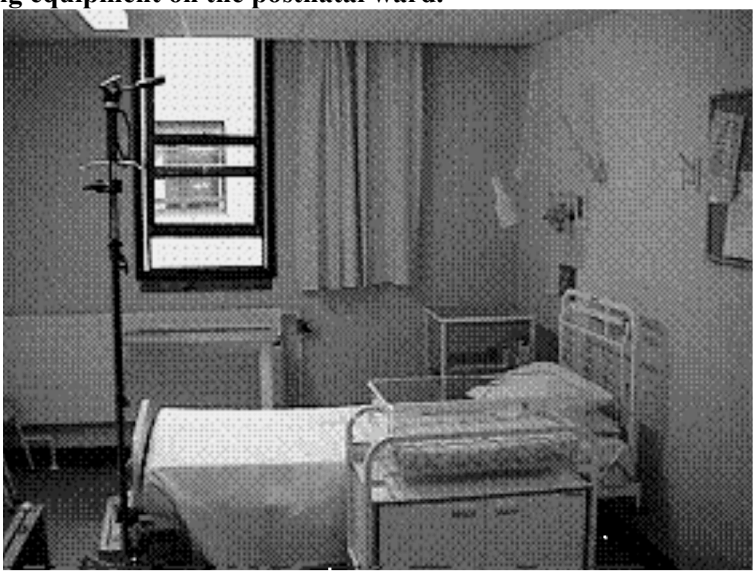
Before travelling to the hospital to conduct the interview and setup the filming equipment, I telephoned the postnatal ward and spoke with the midwife looking after the participant. I checked that it was appropriate for the participant to take part in the study that evening. If the midwife approved, I had her confirm with the participant that she was felt up to filming. If the midwife and participant were happy to proceed, I arrived on the postnatal ward at the end of visiting hours, around 8 p.m. Ethical research involves a continual process of participant consent to protect their autonomy and ensure that their experience complies with negotiated terms (Morris and Bàlmer, 2006).

Upon arrival to the ward, I conducted the semi-structured interview with the participant. This provided an opportunity for her to feel more comfortable with the research and me before I set up the filming equipment. Inappropriately enrolled participants were disqualified from the research at this point and so they were not filmed.

I positioned the equipment in the evening to minimise cluttering the area and to avoid possible tampering with the camera by visitors. The drawback of night-time set up was that sometimes a woman was already sleeping. In these cases, I woke the woman up to alert her of my presence. Then, I setup the equipment in the darkness so as not to cause further disturbance. Problems arose when the equipment did not seem to be working properly. If I was unable to rectify the glitch in the dark, I took the equipment to a lighted area such as the hallway. Time was an issue because I was aware that participants were waiting for me to finish. I balanced the need to solve the technical problems to permit filming against the disruption I perceived to be incurring to individuals. On one occasion, I felt that the circumstances forced me to abandon filming. I apologised to the participant and she was provided with the gift card as thanks for her willingness to take part.

The filming equipment comprised a small Sony TRV18e video camcorder connected to a Panasonic NV-F7760 videocassette recorder. The camcorder's 'night-shot' facility permitted filming in complete darkness, partial darkness or with the lights on. The VCR had a long-play mode that permitted just over an eight-hour recording with the Maxwell E-240 M PAL VHS tape. The VCR was housed in an attaché case that fit under the maternal bed. The case had four rubber stoppers on the bottom and two on one side to ensure stability. I positioned the case at the foot of the maternal bed, or I put the equipment on a tray table if the participant preferred. If a woman anticipated using the remote control to halt recording, she could more easily point the remote control at the VCR when it was in an elevated position and facing her. The video camcorder was mounted on a monopod that I attached to a hospital drip stand by using two super-clamps and electrical tape. Image 3.2 shows how the recording equipment was positioned at the foot of the maternal bed to obtain an aerial view of the mothers and infants.

Image 3.2: Filming equipment on the postnatal ward.



The video camera is mounted on a monopod attached to a drip stand at base of a RVI Ward 32 maternity bed, with the attaché case under the bed. A standalone cot is in the foreground.

A four-inch colour FVS ProD liquid crystal display screen was visible through the top of the attaché case and displayed the image captured by the video camera. I used this to position of the camera (which was at a height of about seven feet) so that both the mother and infant were in view. I encouraged the participant to view the screen if she were interested and use it to adjust the camera back into position if it were bumped in the night. I then placed a folded piece of paper over the screen to prevent the mother being disturbed by the glare. I used electrical tape to secure the equipment to the bed and floor. The audio and visual cables from the camcorder ran directly into the attaché case. I secured the wires along the length of the stand with the electrical tape.

An AEC-Box time code generator (Adrienne Electronics Corporation, Las Vegas) allowed for continuous overlay of a time signal onto the video recording. The time-code was linked in such a way that the counter continued when the tape was switched off, so I was able to ascertain the duration of such 'no data' periods.

The filming equipment was powered by a transformer mounted in the case and required only a single power lead, which I put into a multi-adapter plug so as not to use up one of the two electric sockets devoted to the participant's use (which were often utilised for her electric-powered bed and a fan).

I demonstrated how to use the remote control and asked the mother to start recording once she was ready to sleep. She was instructed to leave the camera recording for the duration of the tape, even if she or the baby moved out of sight. I explained that it was part of the study for me to see how much of the observation period she was in bed, and how much of her time was spent asleep or interacting with her baby. I asked mothers to care for their infants as if the camera were not there. Participants were not instructed to use the cot types in a certain way.[1] I indicated to participants that they should begin recording by using the Panasonic remote control once they were settled for the night. If a woman was ready to begin recording, I hit the record button for her and confirmed that the equipment was

[1] My not instructing the participants how to use the cot types was contrary to the protocol adopted by Ball and colleagues (2006). They directed women to use the assigned cot types as the infant sleeping location. My rationale was to avoid instigating participant reflection on any behaviour due to them being in the study. I specifically wanted to avoid influencing how the mothers thought they should be using the side-car crib or standalone cot, since the randomly allocated cot type was the independent variable for the main outcome measure of breastfeeding frequency.

working. I emphasised to each participant that she was welcome to stop the videotape at any point.

Daytime behaviour was not filmed due to the variable presence of visitors and their interaction with the mother-infant dyad. The first night on the postnatal ward was not filmed because the study location hospital protocol for women who have caesarean sections is to have them in a four-bedded room for 'Day 0.' I anticipated that there would be less space, heightened activity and greater noise levels (all of which could influence breastfeeding) than the more private double- or single-bedded rooms available on 'Night 1.' Additionally, filming in a four-bedded room would have led to a greater chance of inadvertently capturing visual and audio recordings of people who were not participating in the project. The purpose of the study was not to longitudinally compare breastfeeding over the course of the hospital stay; it was to measure the effect of the cot types on mother-infant interactions during the observational period. The objective was to determine if the different line of sight, proximity and/or accessibility afforded by the cot types altered breastfeeding frequency.

Following the night of filming, I returned to the postnatal ward around 10 a.m. to dismantle the equipment and conduct a brief semi-structured interview. The objective of the second interview with each participant was to document maternal feelings about the observed night to compare with video data from the same period. I confirmed with the mothers that they were willing to participate in the telephone follow up. As in the initial research phase, telephone follow up was conducted to longitudinally document the factors that contributed to participant breastfeeding duration. I phoned women periodically on either their home or mobile telephone line through twenty-four weeks postpartum.

Data analyses

Qualitative data analyses

Midwifery research using qualitative methods frequently employs a grounded theory approach to the analysis of interviews.[1] Grounded theory is an iterative process that generates themes as the researcher discovers that participants, when prompted by a broad question, repeatedly discuss similar concepts (Creswell, 2007). The grounded theory approach to interviews was not chosen here because existing literature had already identified themes central to post-caesarean section mother-infant interaction. My interviews addressed issues that have previously been identified as important to breastfeeding after a caesarean section, such as delayed mother-infant contact, anaesthesia side effects on the infant and compromised maternal mobility (Kroeger, 2004). This meant that my results comprised descriptive statistics on participants' accounts of the addressed topics.

Interview data were organised into Microsoft Office Excel version 11.5.2 and explored using thematic content analysis (Wilkinson, 2004). Then, participant responses were systematically coded into quantifiable categories. Professor Ball checked my themes and categories by independently coding a duplicate batch of interviews and discussing any discrepancies. Breastfeeding definitions were consistent with those recommended by the World Health Organization (2008).[2]

Statistical analysis of coded qualitative data was conducted using Microsoft Excel functions.[3] Chi-square tests were used when data consisted of discrete categories in two

[1] For example, see Kjaergaard, Foldgast, and Dykes (2007), Cheyney (2008) and Lalor, Begley and Galavan (2009).
[2] Exclusive breastfeeding means that the infant has received breast milk and no formula, water or other liquids (or solids). Any breastfeeding means that the infant has breast milk supplementation such as formula.
[3] CHITEST and CHIDIST

independent groups. This was to determine if the relative frequency of a certain variable differed more than the proportion expected by chance or random deviations (Siegel and Castellan, 1988). I checked the appropriateness of using chi-square by entering data into an expected frequency table in Microsoft Excel. When the chi-square statistic was invalid due to the expected contingency table containing a value of ≤ 5, I used an online Fisher's Exact test calculator.[1] Both of these tests are non-parametric and do not require data to follow a particular distribution. This statistical method to analyse data is regarded as similar in detecting a real difference when it exists as with parametric tests, such as '*t* methods.' Non-parametric methods are preferred with relatively small sample sizes (Altman and Bland, 2009) and when the researcher sets the numerical scale for variable measurement (Mendenhall, Beaver, and Beaver, 2009).

The characteristics of participants affect the interpretation of their data because certain traits have been associated with breastfeeding outcomes (see Bolling et al., 2007). In describing participants, I provide demographic information on breastfeeding experience by both any duration and for a duration of at least six weeks. I felt it important to document women who had breastfed for only a few days because it acknowledges previous intent in contrast to women who exclusively formula fed previous children from birth. Additionally, the Infant Feeding Survey found that the mothers who had breastfed for six weeks or more were more likely to intend to breastfeed and to continue for longer than those who had not (Bolling et al., 2007).

Behavioural taxonomy

My hypothesis-driven research for the randomised controlled trial focused on coding breastfeeding and other secondary behaviours. The behavioural taxonomy or 'ethogram' comprised behavioural states among mothers, infants and their midwives. This method is based on naturalistic observation of animals (Eibl-Eibesfeldt, 1989).[2] I used Noldus: The Observer version 5.0 to configure the classification catalogue illustrated in Tables 3.4 and 3.5.

[1] Langsrud, Ø. Fisher's Exact Test. 2004. Accessed March 2009 at http://www.langsrud.com/fisher.htm.

[2] For examples of other research with human subjects that utilises ethograms, see Costa and colleagues (2008), Hohman and Figuerdo (2008), Ferari and Addessi (2008) and Hendrie and colleagues (2008).

Table 3.4: Behavioural taxonomy: Types of behaviours.

	Behavioural categories and definitions	Modifier/s for the behavioural class
- Sleep status	Awake: eyes open and/or movements indicate that the participant is awake. Asleep: eyes closed with limited movements.	Orientation; Position
- Infant feeding	Feeding: a mother or her midwife is feeding the baby.[1] Not feeding: no substance is being offered to nor ingested by the baby.	Method; Substance; Success
- Maternal expressing of breast milk	Expressing: mother has functioning equipment positioned on her breast or she squeezes her breast with her hand. Not expressing: no maternal nipple stimulation, other than that potentially incurred by the infant (which is captured by infant feeding behaviour).	None
- Infant crying	Crying: infant exhibits 'sustained' crying, with the episode lasting at least 10 seconds with pauses of less than 5 seconds. Not crying: infant is not crying, or exhibiting small cries in bouts of less than 10 seconds.	None
- Maternal-infant proximity	In contact: mother and infant are in physical contact. Within mom's arm reach: the mother does not have to reposition herself to be able to be in physical contact with the infant. Beyond mom's arm reach: the mother would have to reposition herself to move within range of reaching her infant. Different room: mother and infant are in different rooms.	Degree
- Infant location	Side-car crib: infant is located in the side-car crib. Standalone cot: infant is located in the standalone cot. Bed: infant is located on the maternal bed. Other: infant is in the observation room, but held by the mother or midwife (not while sitting on the maternal bed). Out of room: the infant is located place other than the observation room.	Surface upon which the infant is primarily in contact; Infant out of room with or without mother
- Infant risk	Risk: infant appears to be in a situation that is hazardous, or potentially dangerous. No risk: infant does not appear to be in a situation that could cause immediate harm.	Type of hazard
- Midwife presence	In: midwife is located in the observation room. Out: midwife is not located in the observation room.	None

[1] Infant feeding was defined as the infant's mouth on the breast or bottle nipple. Feeding episodes began and ended with the nipple attachment and detachment. Feeding sessions were defined by episodes separated by at least five minutes. This procedure was consistent as in McKenna, Mosko and Richard (1997). Refer to page 45.

Table 3.5: Behavioural taxonomy: Modifiers of behaviours.

	Modifier categories and definitions
- Sleep orientation	Facing other: participant is asleep, with his/her face tilted towards the other person. Facing away: participant is asleep, with his/her face oriented straight up or to the side opposite to the other person.
- Sleep position	Supine: participant is asleep, with his/her back on the surface of the location. Lateral: participant is asleep, on his/her side on the surface of the location. Prone: participant is asleep, on his/her stomach on the surface of the location.
- Infant feeding method	Breast: the mother's breast is offered/suckled by the infant. Bottle: a bottle is offered/suckled by the infant. Other: a method other than breast or bottle (such as cup, but not including fingers or a dummy) is offered to the infant.
- Infant feeding substance	Breast milk: an infant is offered/ingests breast milk. Formula: an infant is offered/ingests breast milk substitutes.
- Infant feeding success	Attempt: a feeding method/substance is offered up to an infant's mouth, but the infant does not make contact. Success: a feeding method/substance is in contact with the infant's mouth (indications include the mother's gaze leaving the infant's mouth and/or her positioning maintained).
- Degree of maternal-infant proximity	Partial contact: mother and infant are in physical contact, but to a small degree from the infant's point of view (such as a mother holding the infant's hand). Whole contact: mother and infant are in physical contact, to a large degree from the infant's point of view. The infant's body is mostly in contact with the mother (such as an infant being held by the mother or the infant laying up against the mother).
- Infant surface	Mattress: the infant is located on the side-car crib, standalone cot, or maternal bed and the primary surface upon which the infant is positioned is on the mattress of that location. Mother: the infant is located on the maternal bed or on the mother while she is standing up and the primary surface upon which the infant is positioned is on the mother's body.
- Risk type	Position: the infant is asleep on his/her stomach on a surface other than the mother. Falling: the infant is in a precarious position in a location with no means of fall prevention. Suffocation: the infant's airways are covered. Entrapment: the infant is wedged between two surfaces in a location. Overlaying: the infant is trapped under the mother. Other: the infant is in a different hazardous situation (specify in notes). No risk: the infant does not appear to be experiencing a hazardous situation.

An infant sleeping on his/her stomach (prone), especially on soft bedding, is associated with an increased risk of sudden infant death syndrome (SIDS) (Kattwinkel et al., 2005; Moon, Horne, and Hauck, 2007). However, consistent with Baddock (2004) and in previous Notre Dame Sleep Laboratory coding, I did not categorise infant sleep in the prone position while on the mother's ventrum as a risk. Baddock suggests that prone infant sleep while on the mother may not result in the same 'rebreathing' of expired air or thermal stress associated while prone on soft bedding (see Kemp, Nelson, and Thach, 1994). However, there have been SIDS cases in which the baby was prone on the mother's chest (see Peters et al., 2009) so this is an area for further investigation. I did not classify the side

(lateral) infant sleep position as a risk, although it is considered an "unstable" position that can lead to prone infant sleep (Moon, Horne, and Hauck, 2007: 1579). Baddock (2004) observed only one instance of prone sleep as a result of the infant rolling from the side position in videotapes of 80 infants (p. 252).

I did not code infant asleep in a non-prone position on a pillow as a risk. I acknowledge that potentially hazardous situations could develop from this scenario with regards to infant falling or becoming prone risk.

An infant's mouth and/or nose being covered by a blanket or other object are cause for concern regarding suffocation. I considered airway covering a risk although Ball (2001) found that covered infant airways while bedsharing did not impact oxygen saturation among the infants in her study.

'Indeterminate data' was a coding option for each behavioural class and all of the modifiers. This occurred when I could not decipher what was occurring due to the subject being temporarily out of visual or audio range. An example is indeterminate crying when a mother carried the infant out of the room. Additionally, 'no data' was also a potential code for the entire catalogue and occurred when the tape was switched off.

Sleep status was defined behaviourally, in a manner consistent with the taxonomies used by McKenna, Mosko and Richard (1997), Ball and colleagues (2006). I chose not to adopt a time criterion that a subject had to meet before being classed as asleep. Although Baddock (2004) logged sleep after a participant appeared to be sleeping for a period of two minutes, I anticipated a short latency of the sleep onset (Dement and Vaughn, 1999). The lack of physiological measurements to accompany participant images limited the validity of behavioural classifications such as sleep state and risk. However, use of such monitors may have influenced behaviour due to the interference of wires or discomfort from the equipment contact.[1]

I consistently applied the definitions of the behavioural states to all of the tapes to ensure valid measures. I had experience coding videotapes of night-time mother-infant interactions as an undergraduate through independent study modules at the University of Notre Dame. I was supervised in coding by Prof. James McKenna and colleagues' previous work (1997) and the 'Parenting for the First Time Study' that was conducted at Notre Dame in 2004-05.

Sampling of video data

Behavioural data can be sampled either continuously or at specified times over the observational period. The process of viewing data via a structured manner and then converting the noted observation to an abbreviated form for later analysis is called coding. I chose to sample the video data by continuous, or 'all-occurrence' coding, to document a precise record of participant behaviours. This sampling method was possible because I had recorded the data. I coded all of the behavioural classes as 'states.' States capture the complete duration of behaviours, whereas 'events' are coded as having occurred or not. I chose to code all of the classes as states so as not to limit analysis of the data. Frequencies can be deduced from states, as in the breastfeeding sessions being defined as infant off the breast for at least 5 minutes.

[1] This has been a critique of previous maternal-infant night-time investigation because the participant mobility was hampered by equipment such as polysomnography (see Leech, 2006, for a discussion of McKenna, Mosko and Richard, 1997).

I selected focal sampling for my structured observation of the videotapes to document breastfeeding within the context of interactions of mother-infant dyads. This method involved coding the behaviours of the specific individuals for a set period of time for the predetermined behaviours (Martin and Bateson, 1993). Focal sampling provided data for breastfeeding and other relevant behaviours. This method imposed coding restraint, in contrast to noting as much as possible in *ad libitum* sampling. I viewed the videotapes at normal speed, which equated to real-time.

In order to standardise the data among the participants, I coded each tape from when mothers were first asleep through to when the women last woke (or through to the tape end if women were sleeping at the filming completion). This approach enabled the fullest account of the night, instead of limiting the observation time to 4 hours as in the coding by Ball and colleagues (2006). I determined that the point in the recording at which mothers first fell asleep was more appropriate than starting the observation at the start of each tape because the recordings started at different points in women's night-time trajectory of sleep and infant feeding events. The impact of the cots on breastfeeding was best ascertained by standardising what happened between the groups after this common point. This onset of data coding is consistent with Baddock (2004), who began logging video data in her investigation of infant behaviour once the infants first fell asleep.

Reliability of behavioural measures

Although the cot types were evident to me when I coded the videotapes, I used the predetermined behavioural taxonomy to objectively code the behaviours. I was conscious to treat the observations in each tape equally in order to prevent my own expectations from distorting the data. I reviewed participant videotapes in their entirety multiple times; I coded for a limited number of the behavioural classes in each wave of coding. This approach minimised the possibility of me forgetting to note a behaviour in question or missing a code while watching a period of high activity. The tapes were paused, rewound and re-watched until I was confident that the codes were accurate.

A Durham Anthropology Master's student, Dawn Mee, coded a portion of tapes for some of the behaviours as a paid research assistant. I later watched all of those tapes and edited her 'first wave' codes as I coded other behavioural classes. Although Dawn and I coded segments of tapes before she initiated her coding, inter-observer reliability tests were redundant because I revised all of her work. To check my own intra-observer reliability for drift, Professor Ball selected a ninety-minute segment of a tape that I had coded early-on for me to code again at the end. The observation period contained a change in each of the behavioural classes, except for midwifery presence and infant risk. I used the reliability analysis function in Noldus: The Observer to test the overlap of the behavioural classes as a whole, according to their duration. My 0.87 Index of Concordance represented 87% agreement in the proportion of all events. My Cohen's Kappa of 0.86, which is the proportion of agreement that exceeds that expected by chance, was well above the recommended 0.70 threshold (Martin and Bateson, 1993).

Quantitative data analyses

I used Noldus: The Observer to calculate the total duration of each behavioural state and to produce a time-event list of all of the codes and the duration of each occurrence, to the hundredth of a second. I then entered this data into Excel and hand-calculated the number of breastfeeding sessions and other measures such as the mother-infant sleep overlap. Noldus does not have the capacity to analyse such detailed 'lag' codes.

Additionally, I entered the duration data for each of the individuals into another Excel spreadsheet (with their participant numbers enabling a later check of the accuracy). I

calculated the frequency or proportion of behaviour from the total time in which that action was determinable.

The group medians and range were calculated in Excel. The frequency and proportion data were then analysed in SPSS version 17 for the difference of the group means, with the 95% Confidence Interval (CI). If Levene's test for equality of the means had a significance level of ≤ 0.05, then variance was assumed to differ between the groups and I used the corresponding mean difference value and confidence limits. Confidence intervals indicate the reliability of an estimate; less difference between the limits indicates a more reliable result (Field, 2009). A 95% CI means that the probability that the interval will contain the estimated parameter is 0.95 (Mendenhall, Beaver, and Beaver, 2009).

I also calculated the significance level for the quantitative data using the Mann-Whitney U Test. It is a non-parametric statistic for measuring whether the data from two independent samples come from the same distribution. Significance levels that were calculated using the Mann-Whitney U test are indicated in parentheses after the p-value.

I created still images from the video recordings using Adobe Premiere Pro version 2.0. The file names included only participant code numbers for reference to ensure anonymisation. Where I have included the images in this thesis, I blocked out mothers' faces to protect women's privacy, as the thesis will be publicly available via the Durham University Library and the British Library. I did not feel that the newborns were potentially recognisable and so did not block out their faces. I added arrows on the image to indicate the infant location or illustrate a point. Researcher contact details have been deleted from the study documents in Appendices A-D.

Intention-to-treat and on-treatment approaches

Random allocation strives to ensure that the factors that may affect the outcome measures are balanced in the trial groups. The purpose of this study design is to enable the inference of group differences to the effects of the allocated trial conditions (Heritier, Gebski, and Keech, 2003). I examined the demographics of the participants in the two arms of the trial to confirm that they were statistically equivalent in key infant feeding variables such as age, ethnicity, parity and previous breastfeeding experience (see Chapter 4). If discrepancies between the groups were found, post hoc analysis would have been conducted to control for inter-group differences using a multivariate statistical analysis.

The standalone cot and the side-car crib groups are independent samples because the women were prenatally randomised to receive either the control or intervention for the entirety of their postnatal ward stay at the RVI.

I analysed video data by both the intention-to-treat and on-treatment methods. Intention-to-treat necessitates that data analysis of a randomised controlled trial include participants according to the group they were randomly allocated. Cot type compliance factors such as cross-over from a side-car crib to the standalone cot or from either cot type to bedsharing are not differentiated in this analysis method. The strength of analysing data by intention-to-treat is that it most likely represents what would happen in 'real life.' Intention-to-treat is considered to provide the greatest generalisability of results because clinicians expect to experience the same type of adherence issues with people in practice (Fergusson et al., 2002; Zwarenstein et al., 2008). The limitation of intention-to-treat is that it misrepresents of the impact of the conditions when non-compliance is high.

I classified participants as cross-overs from their allocated groups if infants spent 50% or more of their sleep time in a location other than their allocated cot, consistent with Ball and

colleagues (2006). However, because, in contrast to Ball and colleagues, I did not direct women to use the cots specifically as an infant sleep arrangement I also assessed compliance by where the infant was located when the mother was asleep. Both of these methods, infant sleep location and infant location when mother asleep, resulted in identical adherence results. The details are presented in Chapter 7.

Cross-over reflects participant choice and biases the random distribution of variables that may affect outcome measures. I explained to women that the study involved randomisation so that participant characteristics would be evenly distributed between the groups. Mothers assigned to have the side-car crib were provided a standalone cot upon request, but those who were allocated the standalone cot did not have the option to use a side-car crib. Bedsharing was not a study arm in this project, but the arrangement frequently occurred over the course of the observation period in both groups of participants.

In order to provide meaningful and accurate data, I primarily conducted intention-to-treat analysis and did secondary analysis using the on-treatment approach. On-treatment analysis involves data assessment based on the trial conditions that were actually used (Heritier, Gebski, and Keech, 2003). This method is useful to clarify the association of the cot types with breastfeeding frequency, but randomisation is compromised. Minimal inference about the impact of the cots can be drawn from on-treatment data because differential breastfeeding could be due to the characteristics of women who used the cot as various locations for infant sleep. Results of on-treatment analyses are presented in terms of the infant sleep location primarily used during the observation period.

Missing data

Infant crying was coded when possible, but one of the two sets of filming equipment did not consistently record audio. For this reason, the portion of time in which infant crying was determinable prohibited analysis.

Missing data are indicated in all of the results by provision of the different sample size, *n*, than the total number of participants.

Participant disqualification and withdrawal is presented in Chapter 4. The criteria for usable videotapes included that the observation had at least 3.5 hours of data after the mother first fell asleep. The number of excluded observations and the reasoning is detailed on Table 4.1 on page 71.

The purpose of obtaining the video data was to quantify the impact of the cot types on breastfeeding frequency during the second postpartum night. The effect of providing the side-car crib or standalone cot on the timing of breastfeeding initiation was not an appropriate outcome measure for this study because the side-car was provided to the participants when they reached the postnatal ward. The study was also not conducted in a way that permitted valid analysis of the impact of the cot types on whether breastfeeding was occurring (had been initiated or had not been terminated) the second postpartum night. Throughout Phase 2, I encountered substantial difficulty in having midwives provide the side-car crib and this issue continued through the NECOT project (see p. 71). Exclusion of data from participants who had actually not intended to breastfeed or discontinued breastfeeding before the second postpartum night meets the criteria for intention-to-treat analyses described by Fergusson and colleagues (2002).

If a participant permanently discontinued breastfeeding over the course of the second postpartum night her data were not discarded. In such a case, the participant's entire observation period, including the time after breastfeeding cessation, was included. For the

videotapes that were obtained, I analysed all of the behavioural classes according to the frequency or duration of the states during the time within the observation period that each of the classes could be determined. The proportion of determinable time for the main outcome measure of breastfeeding is presented on page 71.

Strengths and limitations

Sound methodology is essential for systematic and valid research. The two phases of this project were designed to contribute to specific areas of knowledge. Qualitative maternal accounts and quantitative behavioural measurements were obtained on the postnatal ward as breastfeeding and any associated difficulties were unfolding. Collection of data in the clinical setting in which the participants were spending their early postpartum time was most appropriate in order to account for the hospital variables contributing to the experiences of these new mothers. Information was gathered by talking directly with participants and by documenting maternal-newborn interactions. A post-discharge interview would have been limited by maternal recall and may not have such a high response rate because of the transition to life at home with a new family member.

Mixed data collection and analysis methods were chosen to improve the quality and depth of the research through integration of various perspectives of the women's experiences. Combining methods in the studies facilitated more comprehensive knowledge because I could make up for limitations of a single approach (Flick, 2007). The randomised trial videotapes may have decontextualised the outcome measure of breastfeeding (Morse, 2005) if interviews had not been conducted before and after the recordings. As discussed by Silverman (2004), it was important not to take for granted what the observational data appeared to be showing. I reviewed the interview data to confirm the observations, such as if a bottle contained breast milk or formula. The combination of semi-structured interviews, medical notes, informal observations and a video record of night-time behaviour contributed to a systematic exploration of breastfeeding and factors that influenced the process. Table 3.6 summarises the strengths and limitations of the methods that I employed.

Table 3.6: Strengths and limitations of the adopted research methods.

	Strengths	Limitations
- Semi-structured interviews	Addressed a specific range of issues known to be related to breastfeeding after a caesarean section delivery; format adaptable to participant style and the content of their responses	Provided more depth than questionnaires and more focus than open interviews, but not the level of details that is gathered through extended participant observation
- Randomised controlled trial of postnatal ward cot types	Novel research for this population; Balances known and unknown participant characteristics between the two groups; Strict adherence to inclusion and exclusion criteria ensured relatively homogenous samples for comparison	High levels of participant disqualification; Lengthy recruitment process; Unable to require participants to use the cots in a certain way so there are compliance issues; Midwives failed to reliably provide the side-car crib to participants

Table 3.6: Strengths and limitations of the adopted research methods (continued).

- Video recording of mother-infant interactions on the postnatal ward	Capture experience of mother-infant interactions in a level of detail that improves understanding better than only verbal descriptions or still images; Enables objective quantification of behaviour	Camera was stationary so there are periods of indeterminate behaviours due to the mother and/or infant being out of sight and audio; Maternal concerns regarding the recording of breastfeeding
- Remote control to start/stop video recording	The option of halting recording protected women's comfort and minimised the disruption to their night	No data periods when women turned off recording, which was more likely to occur when breastfeeding because of unease of breastfeeding in public
- Continuous coding of video data	Enabled precise measurements	Required an extensive time commitment to code the 34 tapes which lasted between 4-8 hours for all of the behavioural classes and modifiers
- Intention-to-treat analysis	Results are indicative of 'real-life' use and expected impact if the intervention were adopted in practice	Unable to require compliance to randomly allocated conditions, so behaviours may not be due to the cot actually used
- On-treatment analysis	Clarifies the association of the cot with observed behaviours	Unable to infer that behaviours were due to the cot used, since randomisation of participant characteristics is biased

As with all consented research, the study results were limited to the experiences of those able and willing to participate. Women who were the most unwell after a caesarean section delivery were less likely to take part, so the results may underestimate some of the infant care difficulties experienced among the wider population of women who undergo caesarean section delivery.

Summary

This study was conducted in two phases and analysed using a mixed-methods approach. Both stages involved semi-structured interviews after unscheduled or scheduled caesarean section; the second was in combination with video documentation of the impact of a randomised intervention on breastfeeding following scheduled caesarean section delivery. The overnight postnatal ward observation is a novel approach for investigating maternal experiences in this population.

The Parkes Foundation and the Owen F. Aldis Scholarship Fund provided funding. The Durham Anthropology Department and National Health Service research ethics committees approved both phases. A gift voucher was provided to participants as a thank you, and copies of individual videotapes were posted to the women.

I analysed the qualitative data by entering the verbatim responses into Microsoft Excel, and then coded these statements into quantifiable categories. Most questions were open-ended, so it is possible that the proportion of women who described certain things would be different if they were explicitly asked. The results represent the participants for whom the particular issues were prominent.

I evaluated observational data using ethological coding of videotapes within Noldus: The Observer. Group differences between those randomly allocated the cot types (intention-to-treat) and those who primarily used various locations for infant sleep (on-treatment) were compared using SPSS to calculate means and p-values via the Mann Whitney U test. I calculated the medians and ranges in Excel. Professor Ball verified the codes and my intra-observer reliability achieved a Kappa score of 0.86 for the proportion of all of the behaviours.

The next chapter presents the study conduct and participant demographics. The results suggest that, although I encountered difficulties in conducting Phase 2, this type of research is acceptable among new mothers and feasible to conduct. The data also indicate that the ways in which women prenatally anticipate infant feeding as impacting their lives factor into their breastfeeding intent.

Chapter 4: Research conduct and participant demographics

The data reported here are the conduct of the research, participant demographics and maternal descriptions of their prenatal breastfeeding intentions.

Research conduct

Phase 1

The majority of the women were willing to take part and met the inclusion criteria of having delivered by caesarean section, being at least 18 years old and fluent in English (refer to pp. 40-41).

A total of 75 women completed the postnatal ward interview and 24 provided post-discharge breastfeeding data. The recruitment, enrolment and study completion details are outlined in Figure 4.1.

Figure 4.1: Recruitment of Phase 1 participants and their study completion.

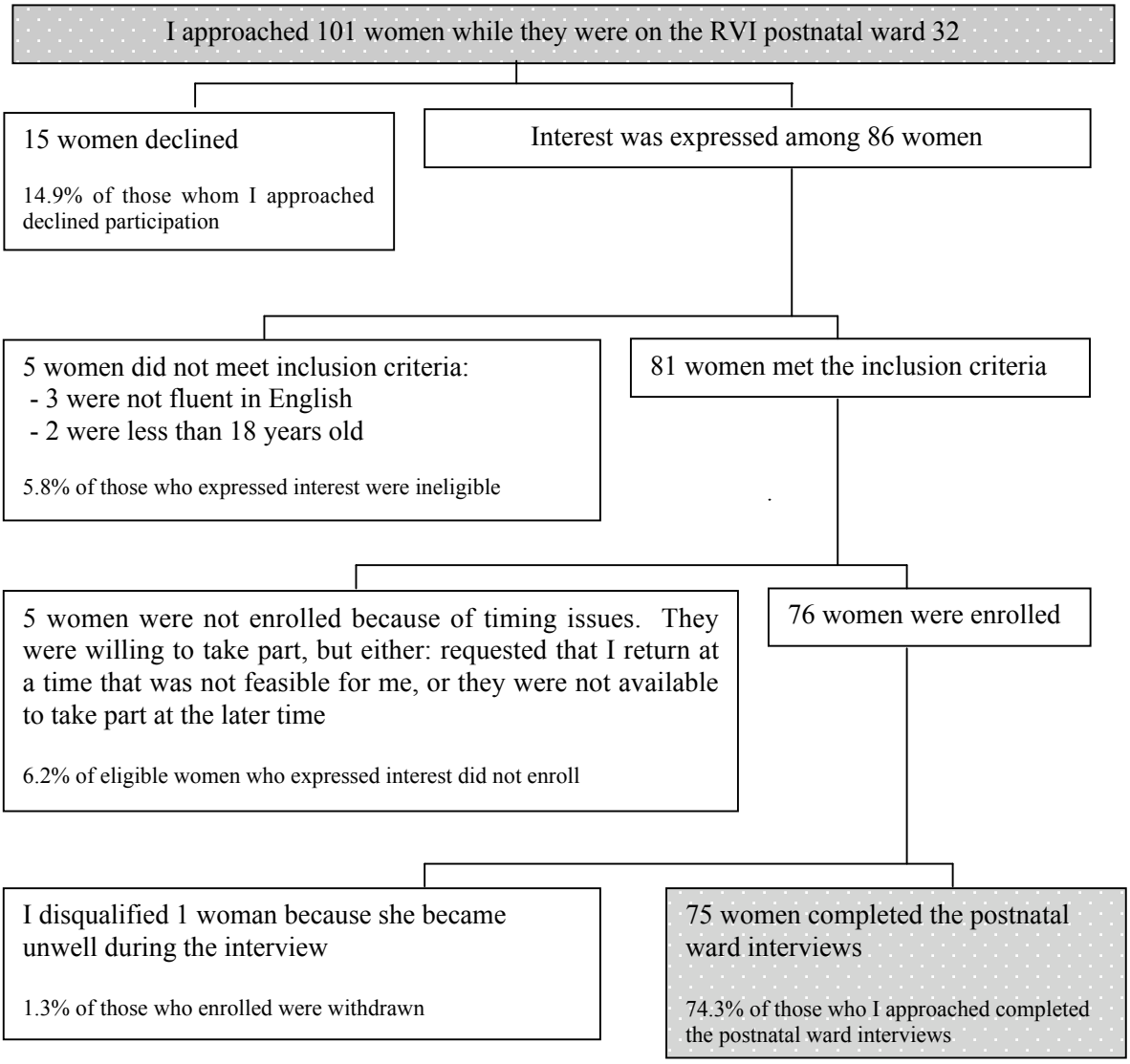


Figure 4.1: Recruitment of Phase 1 participants and their study completion (continued).

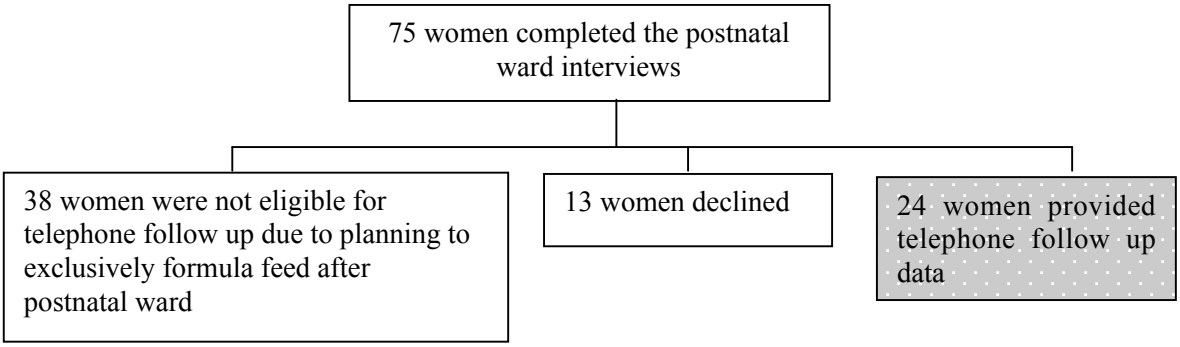
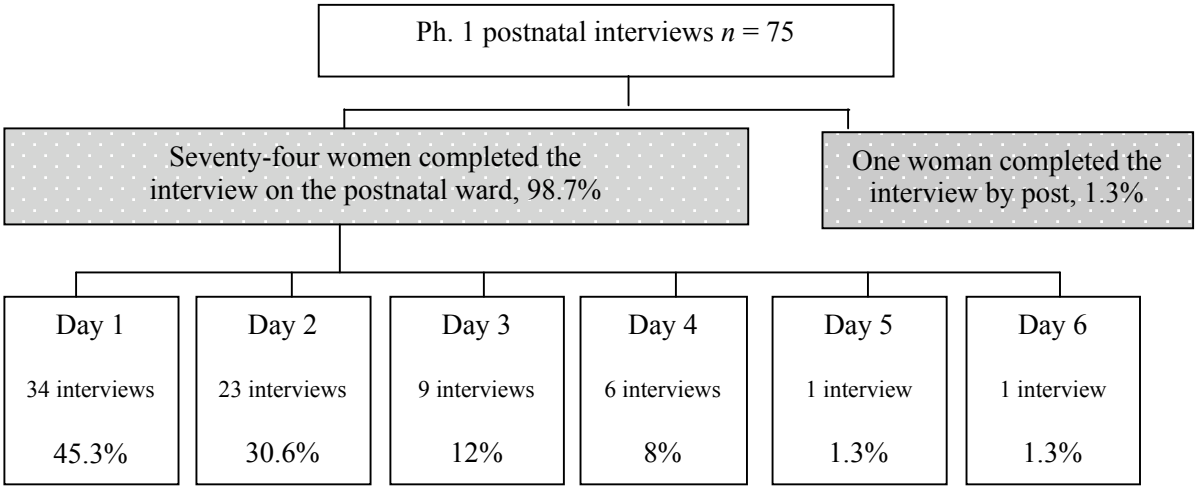


Figure 4.2 shows that I conducted the greatest proportion of the Phase 1 interviews on the day after participants' caesarean section delivery. As stated on page 56, this is referred to as postpartum 'Day 1.'

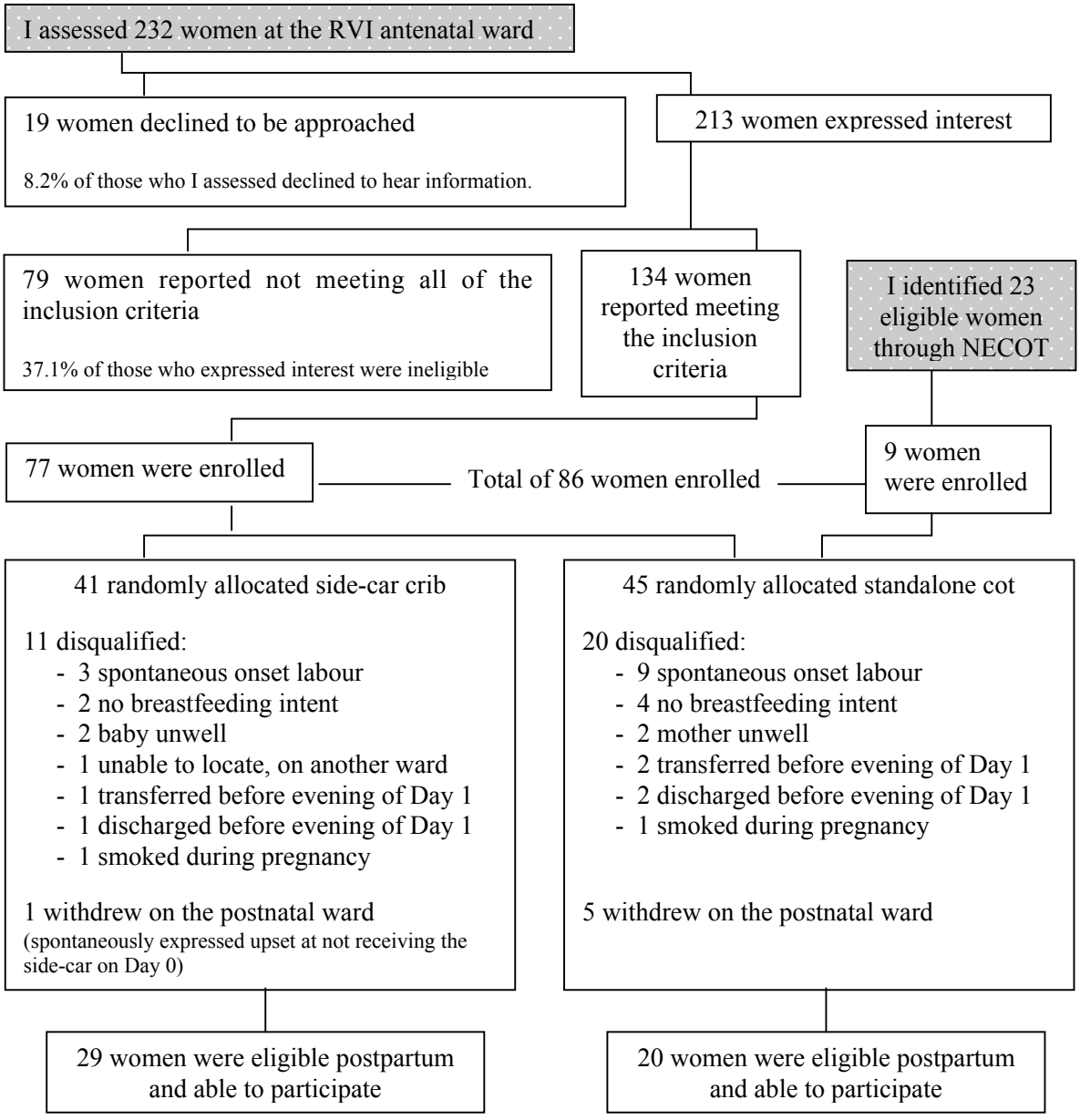
Figure 4.2: Timing of Phase 1 postnatal ward interviews.



Phase 2

Most of the women whom I assessed met the inclusion criteria and about half of those eligible enrolled. The recruitment, enrolment and study completion details are outlined in Figure 4.3.

Figure 4.3: Recruitment of Phase 2 participants and their eligibility.[1]



The study completion in the semi-structured interviews on the postnatal ward, the overnight video recording and the telephone follow up are provided in Figure 4.4.

[1] The rate of enrolment to those eligible was 77/134 = 57.5% face-to-face and 9/23 = 39.1% postal recruitment. The total rate of enrolment among those who expressed interest and were eligible was (77+9)/(134+23) = 54.8%. The rate of withdrawal did not significantly vary by cot type allocation, p = 0.0816.

Figure 4.4: Phase 2 participant study completion.

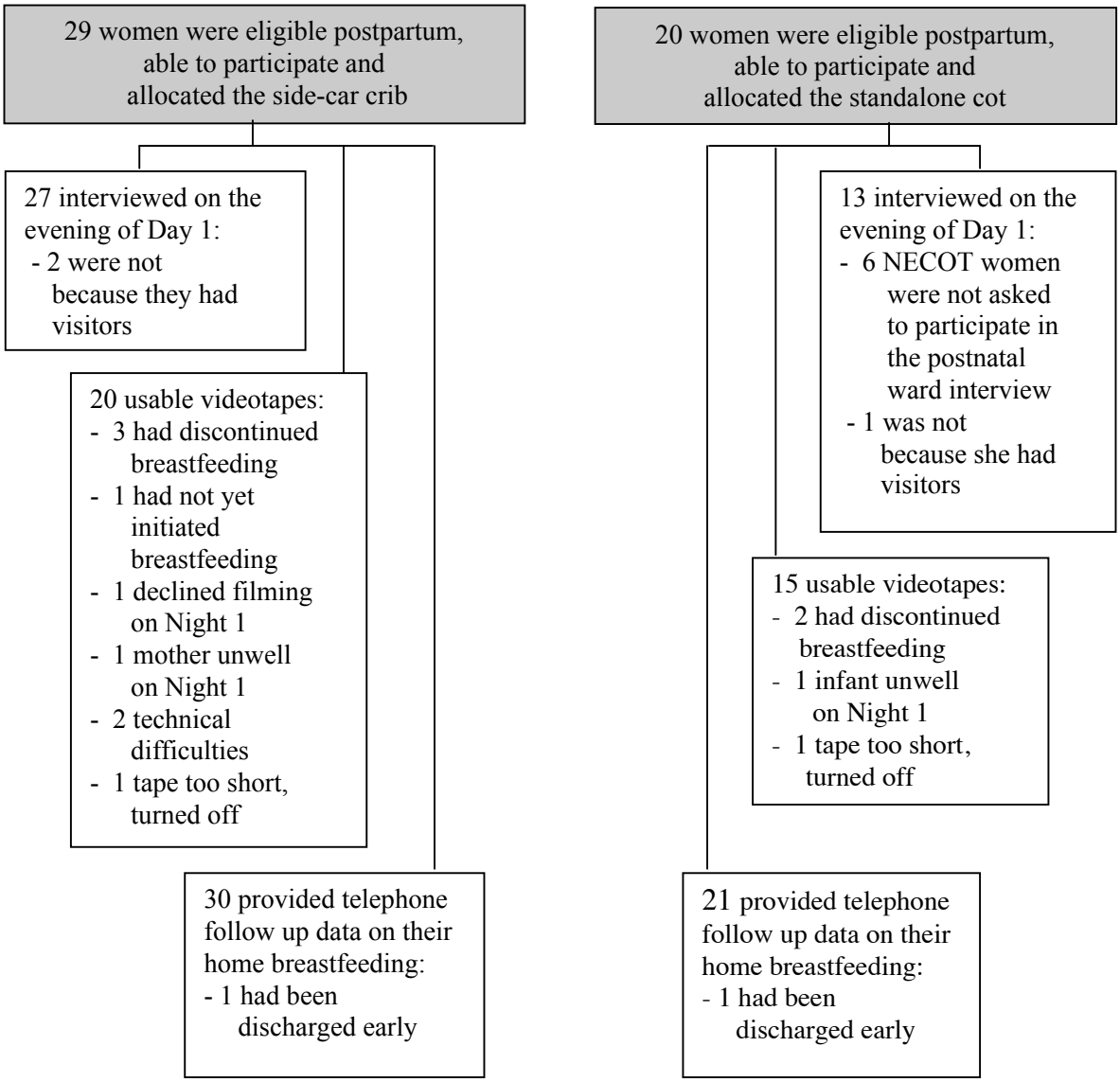
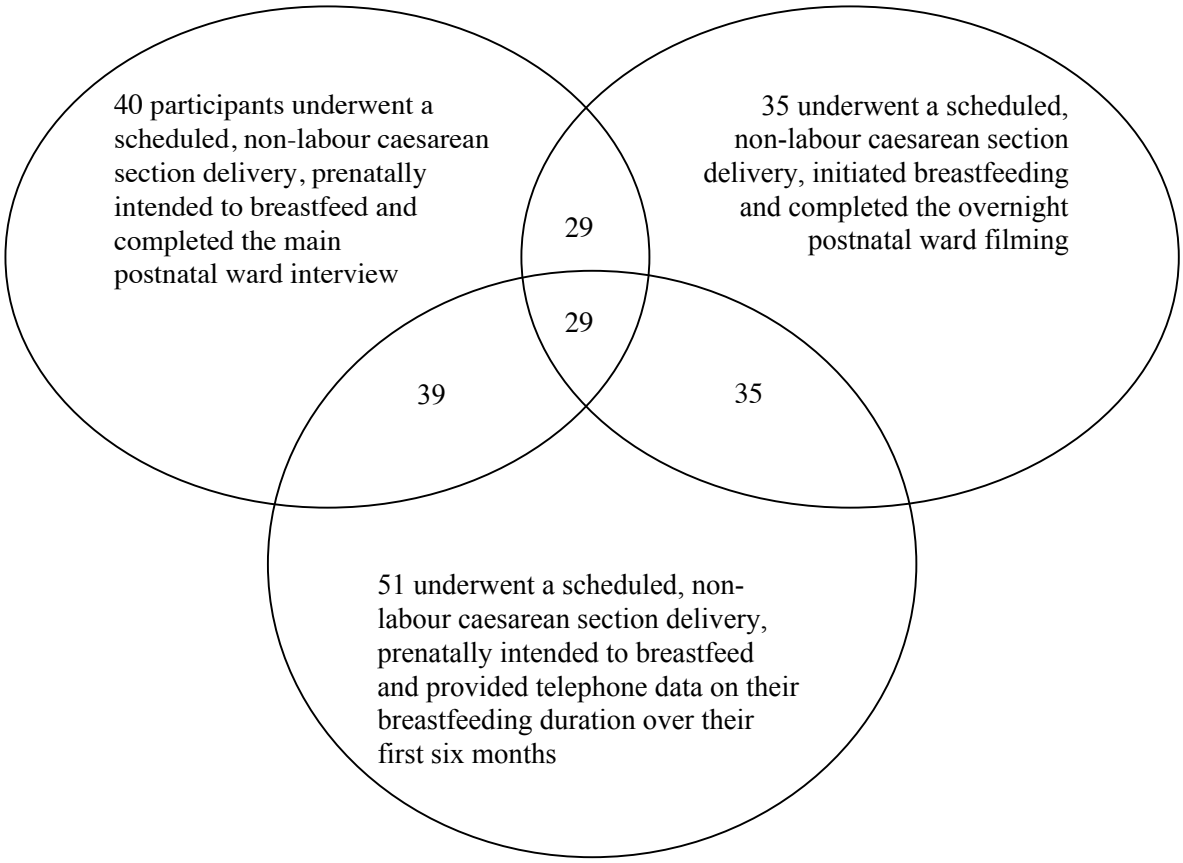


Figure 4.5 simplifies the sample size obtained in the various stages of the Phase 2 research.

Figure 4.5: Summary of participation in the various aspects of the Phase 2 research.



Side-car crib provision

My record of when side-car cribs were received by the participants was that about a quarter[1] were provided on Day 1 instead of by the evening of Day 0 as agreed with midwives before the initiation of the project. The lack of consistent midwifery support was surprising because of the predetermined study protocol (refer to p. 37). In an attempt to eliminate the late provision, I often travelled to the Royal Victoria Infirmary to secure the side-car cribs myself.

Video observation

With regards to the main outcome measure of infant feeding frequency, most of the videotapes had at least 90% determinable time. This means that I was able to assess whether the infant was latched on the breast by visual and/or audio observation. The remaining tapes that Professor Ball and I considered to have sufficient data for inclusion are detailed in Table 4.1.

Table 4.1: Videotapes in which infant feeding could be determined in less than 90% of the observation period.

	Infant feeding was determinable	Difficulty in determining infant feeding	Infant feeding was determinable
Participant #	%	Reason	Hours
- 19	61	Obstructed vision	4.96
- 77	56.4	Camera turned off	5.56
- 1728	74.8	Obstructed vision	6.08
- 1765	81.5	Obstructed vision	6.63

[1] Side-car cribs were received late in 7 of 29 cases (24.1%).

No participants expressed complaint about the experience of being filmed. Various women spontaneously said that they had anticipated being aware of the camera during the night but that it had actually not bothered them. However, two participants halted and then restarted the recording. Because of this missing data and the likelihood that the camera was switched off due to concerns for breastfeeding privacy, I included an estimate for this possible breastfeeding in both the intention-to-treat and on-treatment analyses.[1]

Participant demographics

Maternal

The recorded characteristics of maternal participants are presented in Table 4.2.

Table 4.2: Maternal demographics.

Participants	Ph. 1 $n = 75$
	Ph. 2 $n = 46$
	Median (range) or *n*, %
Obstetric history:	
- Previous deliveries	0 (0 – 3)
	1 (0 – 6)
- Previously had a caesarean section delivery	22, 29.3
	26, 56.5
- Previously had complications with vaginal delivery	33.3% of the women who had a vaginal delivery
	87.5% of the women who had a vaginal delivery
Maternal characteristics:	
- Age in years	$n = 73$ 29 (18 – 41)
	34 (23 – 41)
- Living with partner	64, 85.3
	45, 97.8
- Married	37, 49.3
	36, 78.3
- Level of education completed	$n = 74$ Attended university (no GCSEs – Doctorate)
	$n = 44$ Undergrad. degree (no GCSEs – Doctorate)
- Household income over the past year in thousands of Great Britain Pounds	$n = 58$ 30 – 35 (10 – 70+)
	$n = 40$ 40 – 45 (5 – 70 +)
- Smoked throughout the latest pregnancy	$n = 68$ 10, 14.7
	None (exclusion criterion)
Infant feeding:	
- Previously breastfed (for any duration)	19, 25.3
	33, 71.7
- Previously breastfed (for $\geq$ 6 weeks)	$n = 73$ 12, 16.4
	27, 58.7

[1] See Appendix G, page 270, for the separate presentation of observed breastfeeding sessions that occurred in the determinable time and a combination of observed plus estimated breastfeeding sessions. I estimated one successful breastfeeding session each time the camera was turned off (when the no data periods were consistent with the predefined breastfeeding episodes, refer to p. 45). I did not include estimations when analysing the proportion of the observation period spent breastfeeding because it would have been inaccurate to estimate the entire 'no data' time as having been spent breastfeeding.

Table 4.2: Maternal demographics (continued).

- Intended to breastfeed (any) during the latest pregnancy	53, 70.7
	All (inclusion criterion)
- Intended to breastfeed (exclusively) during the latest pregnancy	49, 65.3
	39, 97.5
Ethnicity:	
- White European	64, 85.3
	39, 84.8
- Afro-Caribbean	1, 1.3
	2, 4.3
- Asian	10, 13.3
	5, 10.9

Stratified maternal demographics are provided in Appendix G for:
- whether women scheduled the Phase 1 caesarean section delivery, page 256
- the levels of study participation completed in Phase 2, page 258
- the cot type randomly allocated, page 260
- those who complied with the randomly allocated cot type, page 272
- the cot groups from which Phase 2 bedsharers derived, page 274

Infant

The recorded characteristics of infant participants are presented in Table 4.3.

Table 4.3: Infant demographics.

Participants	Ph. 1 $n = 82$	
	Ph. 2 $n = 46$	
	Median (range) or n, %	
Infant characteristics:		
- Singleton	68, 90.7	
	100 (inclusion criterion)	
- Female	$n = 81$	42, 51.9
		29, 63
- Gestational age in days	$n = 73$	276 (213 – 300)
	$n = 41$	274 (263 – 289)
- Weight in kilograms	$n = 81$	3.38 (0.73 – 4.60)
		3.59 (2.30 – 4.55)
- APGAR at 1 minute	$n = 77$	8 (1 – 9)
		9 (8 – 9)
- APGAR at 5 minutes	$n = 76$	9 (3 – 10)
		9 (9 – 10)

Stratified infant demographics are provided in Appendix G for:
- whether the infant was scheduled to undergo a caesarean section in Phase 1, p 257
- the type of caesarean section delivery infants underwent in Phase 1, page 257
- the levels of study participation completed in Phase 2, page 259

- the cot type randomly allocated, page 261
- those whose mothers complied with the randomly allocated cot type, page 272
- the cot groups from which Phase 2 bedsharers derived, page 275

Breastfeeding data are presented for those who had healthy infants only. The total samples were 46 from Phase 1[1] and 40 interviews/ 35 videotapes from Phase 2.

Maternal breastfeeding intentions

As shown in Table 4.2, about 70% of Phase 1 participants reported that they had intended to breastfeed.[2] Overall, 65.3% of Phase 1 women described breastfeeding intent initially exclusive of formula provision.[3]

In response to the postnatal interview question "what factors influenced this decision" some of the same variables were provided both for and against breastfeeding. Figure 4.6 lists the categories that I created from their reported reasons, such as convenience.

Figure 4.6: Maternally reported factors that influenced their prenatal intentions for infant feeding.

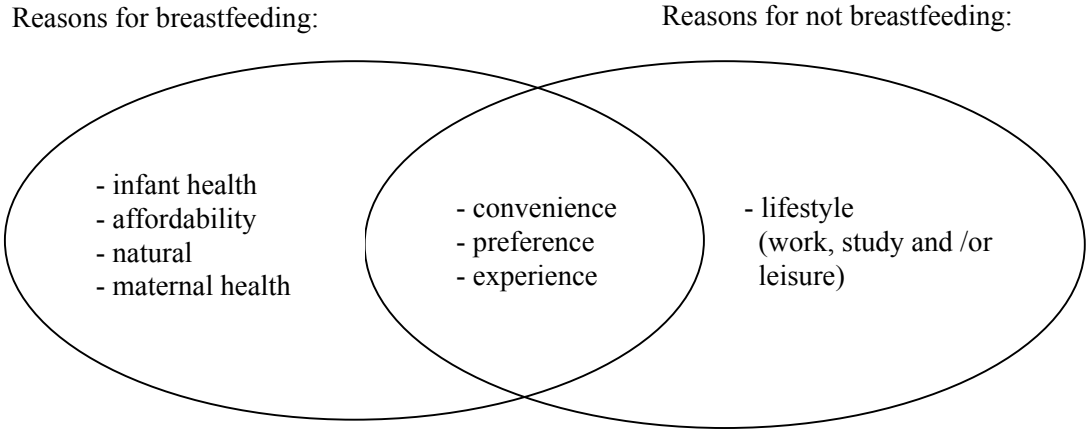
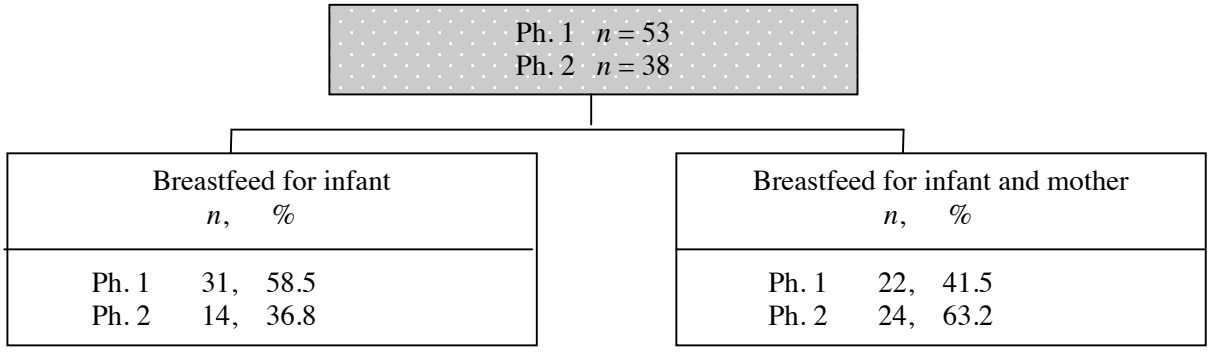


Figure 4.7 further illustrates that many participants spontaneously offered maternal advantages to breastfeeding when reporting the rationale for their intent.

Figure 4.7: Maternal description of breastfeeding benefits.



[1] The breastfeeding sample from Phase 1 comprised 46 women. There were 30 who underwent an unscheduled caesarean section because 17 of the 48 intended formula and 6 had infants who went to the Special Baby Care Unit (SBCU). There were 16 who underwent a scheduled caesarean section delivery because 5 of 22 intended formula and one went to the SBCU.

[2] Phase 1 women recalled prenatal intent to breastfeed in 53 of 75 cases (70.7%). Prenatal breastfeeding intent was an inclusion criterion for Phase 2 participants.

[3] In response to "what did you plan/want to feed your baby before you gave birth," 4 Phase 1 participants and 1 Phase 2 participant specifically stated a combination of breast milk and formula from birth. Among those who reported any prenatal breastfeeding intent, 39 of 53 (92.4%) and 39 of 40 (97.5%) described breast milk only.

Infant reasons

Breastfeeding intent was dominated by the 'breast is best' mantra of broad infant health benefits:

> "Because they say that it's better for them."
>
> Ph. 1 Part. 74. Her previous baby died due to a pre-existing heart anomaly within hours after an unscheduled caesarean section.

> "Just because it's supposed to be better for baby. You're supposed to try…"
>
> Ph. 1 2 Part. 53. She had not breastfeed her previous, vaginally-delivered child.

> "It's best."
>
> Ph. 1 Part. 19, first time mother.

> "Good for baby."
>
> Ph. 2 Part. 77. She breastfed her previous, caesarean section-delivered child.

Some participants spontaneously provided a more precise rationale for their decision.[1] These infant advantages were due to the composition and protective effects of breast milk:

> "The fact that it's better for baby…more nutritious with antibodies and rest of it."
>
> Ph. 1 Part. 50. Her previous baby died after an unscheduled caesarean section for preeclampsia.

> "Health of the baby…all the benefits. We're vegetarians and lots of formula has fish oil and all sorts of chemicals."
>
> Ph. 2 Part. 51. She had not breastfeed her previous, vaginally-delivered child.

Breast milk was also discussed as particularly beneficial for infants as a coping strategy for premature delivery:

> "If I had went full term would have bottle-fed, but because he is premature I'm going to breastfeed."
>
> Ph. 1 Part. 12. She had an unscheduled caesarean section delivery without labour under general anaesthesia at 28 weeks gestation for placental abruption. Her infant was in the Special Baby Care Unit and she was expressing breast milk.

> "I know it's healthier for her and it'll help her more."
>
> Ph. 1 Part. 57. She had an unscheduled caesarean section delivery with spinal block anaesthesia at 30+3 weeks gestation for preeclampsia. Her infant was in the Special Baby Care Unit and she had not initiated expressing yet [on postpartum Day 1] "because my first night I had a proper sleep. From now I will express once in the night to build it [her milk supply] up."

[1] Specific health aspects of infant benefits to breastfeeding were mentioned by 6 of 31 Phase 1 (19.4%) and 1 of 14 Phase 2 (7.1%) women.

Included maternal reasons

The mothers who additionally cited breastfeeding self-benefits provided a range of advantages. These included closeness with their infants, convenience, breastfeeding being 'natural,' breastfeeding as a rewarding experience, fulfilling expectations of family/friends and cost effectiveness:

> "Much healthier, very natural and always got a supply with you."
> Ph. 2 Part. 19, first time mother.

> "It's easy, isn't it….having it there ready."
> Ph. 2 Part. 28. She breastfed her previous, vaginally-delivered child.

> "Always wanted to and I think it's probably for the best."
> Ph. 1 Part. 63, first time mother.

> "I've done it before and find it easier. It's supposed to be better for baby."
> Ph. 2 Part. 3. She breastfed her previous, vaginally-delivered child.

> "It's just natural. Good to try breastfeeding and if not [successful] you can always do other [feeding methods]. It [breast milk] is safer, with it being yours. I'm not saying anything else isn't safe, but it's supposed to be best thing for baby."
> Ph. 2 Part. 52. She breastfed her previous, caesarean section-delivered child.

> "My mom's influence…she breastfed me and my sister. My sister breastfed her children. Plus, I think it's the right thing to do."
> Ph. 2 Part. 74. She breastfed her previous, vaginally-delivered child.

Maternal health was mentioned by 9% of Phase 1 and 29% of Phase 2 women.[1] As with the infant-based benefits, the participant descriptions of the impact of lactation on themselves were unspecific, except for its association with losing weight:

> "What I hear best for baby and benefits for mother I guess, basically that's why."
> Ph. 1 Part. 18. She breastfed her previous, caesarean section-delivered child.

> "Best for baby and helps you lose weight."
> Ph.2 Part. 56. She breastfed her previous, caesarean section-delivered child.

> "Just cause it's supposed to be best for them, cheaper, lose weight…all those different things they tell you. It's something I always wanted to do really."
> Ph. 1 Part. 31, first time mother.

The few women who discussed prenatal intent to supplement breastfeeding with formula from birth explained that the mixed feeding was intended to either satiate their infants in the early postpartum period before their breast milk 'came in,' grant them more independence while providing some health benefits for their infants or better enable to them to cope with the demands of breastfeeding.

Maternal reports of intended breastfeeding exclusivity did not significantly vary by the

[1] Maternal health benefits were mentioned by 2 of 22 Phase 1 (9.1%) and 7 of 24 Phase 2 (29.2%) participants.

reported reasons for breastfeeding intent[1] or the randomly allocated postnatal ward cot type.

Breastfeeding experience and support

Due to the recruitment of Phase 1 women regardless of their current or intended feeding method, I was able to ascertain that most of the first-time mothers intended to breastfeed and, as would be expected, previous infant feeding strongly influenced parous women's breastfeeding intent.[2]

Multiparous women who had not previously breastfed but did plan to during their latest pregnancy explained that they felt that they had either not had the opportunity to breastfeed before[3] or they cited infant health as the reason for their changed approach to infant feeding:

> "I didn't get a choice with my first one [baby]. I had general anaesthesia [with an unscheduled caesarean section delivery for indications of foetal distress]. I was knocked out completely and when I came around, my baby had [been given a] bottle."
>
> Ph. 2 Part. 11. She had a scheduled 'repeat' caesarean section delivery.

> "Last time I wasn't able to. The last place [where she delivered her previous child] was busy and the midwives weren't available [to assist]."
>
> Ph. 2 Part. 51. She previously had a vaginal delivery with complications.

> "I tried [after her last delivery]. I was tired because of all the blood that I lost. Last time I wanted to sleep for 2-3 weeks. [She had a retained placenta removed under general anaesthesia after the vaginal delivery]. I have more energy now."
>
> Ph. 2 Part. 53. She has a scheduled caesarean section delivery for breech positioning.

> "I thought I'd try [breastfeeding]. It's meant to be better for the baby anyway."
>
> Ph. 1 Part. 36. She had exclusively formula fed her previous, vaginally-delivery child.

Few women said that they felt pressure to breastfeed, most perceived others as supportive and only one did not know someone who had breastfed.[4] Many said that they knew breastfeeding was encouraged, but that a mother needs to choose what is right in her circumstances. Pressure from outside sources was described as negated when breastfeeding was something that the mothers wanted to do anyway. Perception of heightened maternal tiredness due to breastfeeding was specifically mentioned as a reason that family members did not support a mother's intent.

---

[1] In Phase 1, none of the 22 women who reported maternal advantages in their breastfeeding intent said that they planned to supplement with formula from birth compared to 4 of the 31 who provided infant-only benefits, p = 0.1324 (Fisher's Exact test). In Phase 2, one of the 24 women who reported maternal advantages for breastfeeding intent said that they planned to supplement with formula from birth compared to none of the 16 who cited infant-only benefits, p = 1.0000 (Fisher's Exact test).

[2] Breastfeeding intent was reported by 31 of 42 first-time Phase 1 mothers (73.8%). Of the 19 who had breastfed before (for any duration), 18 intended to provide breast milk for the current infants (94.7%). Part. 48 explained that her previous baby "wouldn't take to it" and she had switched to bottle feeding before postnatal ward discharge because it was "just easier." All 12 of the Phase 1 participants who had breastfed for at least six weeks intended to breastfeed again.

[3] Three of the 8 parous women who had not previously breastfed had suffered neonatal deaths.

[4] Pressure to breastfeed was affirmed by 3 of 38 Phase 2 women (7.9%). Three of 38 Phase 2 women described having mixed support (7.9%)

Results summary

Most eligible women were willing to take part in the research, although, as expected, less so with Phase 2. Additionally, a substantial amount of Phase 2 women were disqualified. This was mostly due to spontaneous onset labour or misrepresentation of an inclusion criterion.

Potential participants almost exclusively expressed preference to be allocated the side-car crib and cited previous postpartum mobility issues. The enrolment of participants who had no breastfeeding intent or smoked in pregnancy may have been due to intentional falsification of eligibility in an attempt to obtain the side-car crib because it was only available to those mothers who were enrolled in the project and randomly allocated to receive it. Five of the six women who withdrew had been randomly allocated the standalone cot.

Despite confirming the appropriateness and willingness of the midwives to secure the side-car crib, I attached many and almost a quarter were provided late. The delay in obtaining the crib could have affected breastfeeding during the observation period because I predicted it would alter the cascade of mother-infant interactions. The reason for discontinuing participation was never asked (as per ethics requirement), but the one side-car crib participant who withdrew spontaneously offered that she was disappointed not to have received the cot on Day 0.

Some videotapes were excluded from analyses because they did not provide appropriate data to contribute to the hypothesis being tested. Observations that were too short, offered no possibility of breastfeeding or documented unwell infants were not comparable to the rest of the healthy breastfeeding dyads. The dynamic process of recording, with the mother having a remote control, meant that participants could feel comfortable with the behaviour being recorded but led to a few periods of missing data.

Most Phase 1 participants were White European first-time mothers who were unmarried but living with their partner. Phase 2 participants were mainly multiparous White European women who were married. Most multiparas had either previously undergone a caesarean section or had complications with vaginal delivery.

Convenience, maternal preference and experience with infant feeding experience were offered by some women as reasons for breastfeeding and by others for formula provision. Most breastfeeding factors were broadly related to infant health, although some participants spontaneously highlighted the composition of breast milk or its protective effects for premature infants. Reasons for breastfeeding were often expressed in a distant manner, such as what they "hear" is "meant to be" better. About half of the participants cited maternal benefit in their reasons for breastfeeding intent. Few women said that they felt pressure to breastfeed, most had the support of those important to them and all but one knew others who had breastfed. Maternal tiredness was a factor spontaneously mentioned for why family members did not support breastfeeding. Overall, participants said that they knew breastfeeding was encouraged, but that a mother needs to choose the infant feeding method right for her circumstances.

Discussion

Study conduct

The recruitment and study participation suggests that most women are willing and able to participate in research in the early days after a caesarean section delivery.

The timing of my interviews and the proportion of women who reported intent to breastfeed suggest that the data I obtained accurately reflect the national situation. In England during the Phase 1 period, 70% of women who gave birth by caesarean section spent one or two days on the postnatal ward (HES, 2009) and the average length of postnatal ward stay did not vary according to initial infant feeding method (Bolling et al., 2007). The greatest proportion of my interviews was conducted on postpartum day 1. Despite a slightly higher national rate of women who had a caesarean section delivery staying in the hospital for postpartum Days 1-2 during Phase 2 conduct (HES, 2009), a few participants were not interviewed or filmed because of discharge on Day 1. I did not collect data on whether this was due to them feeling exceptionally well or wanting to alter their postnatal environment (see Chapters 6 and 7 for maternal concern for limited postnatal ward sleep and pp. 121-122 for how the desire to be discharged influenced a woman's switch to formula feeding). Robinson (2009) found that among a sub-sample of NECOT participants (n = 49), those allocated the side-car crib left the postnatal ward earlier than those with the standalone cot, p = 0.042. The analysis included equivalent proportions of women who underwent caesarean section delivery in the two groups. She did not collect data on the reasons for the discharge timing; it is an issue for future research because of the health and financial importance. The rate of breastfeeding intent reported in Phase 1, 70.7%, was similar to the 72% of recently parturient women (by any birth mode) in England but was higher than the 59% average in the Northeast (Bolling et al., 2007). The national data did not differentiate rates of *intended* infant feeding by birth mode. However, it does show that 76% of mothers in the UK initiated breastfeeding after a caesarean section delivery in 2005.

My Phase 2 rate of enrolment was better than the 35% estimated by Ball and colleagues (2006) for their randomised trial of postnatal ward cot types and overnight filming of vaginally-delivered mother-infant dyads at the same study hospital. Despite the relatively long recruitment period of January to December 2007, I obtained 30 usable videotapes. Re-application to the NHS Research Ethics Committees enabled extension from October to March 2009. This resulted in the modest, but valuable addition of 5 usable observations to bring the two filmed groups to a comparable 20 with the side-car crib and 15 with the standalone cot. The difficulty in recruitment was presented in Figure 4.3 and included 37% of women who expressed interested in participating not meeting the inclusion criteria and 36% of those enrolled being disqualified. Failure to obtain the target sample size within the time originally specified occurs in over two-thirds of trials (Campbell et al., 2007). Clinical researchers frequently encounter these problems. I implemented all applicable strategies from other maternal or newborn trials (Tooher, Middleton, and Crowther, 2008) to maximise participation without compromising the controlled design or ethical conduct. As previously discussed (refer to p. 54), I minimised potential resentful demoralisation by explaining the rationale for the cot randomisation during recruitment.

Some post-enrolment disqualification may be due to deliberate manipulation by women to try to obtain a side-car crib. The maternal expression of preference to be allocated the side-car crib and the higher withdrawal rate among those allocated the standalone cot adds weight to the perceived need among mothers to improve their postnatal ward environment. The interplay between people and place is increasingly being identified as a contributor to health variation as a result of how individuals mediate interactions within their environment (Cummins et al., 2007). A reflexive approach of the context is advocated for better understanding of how a setting influences maternity care (Wrede et al., 2006). Having an intervention available only within a trial is one of the factors associated with successful recruitment (Campbell et al., 2007), but my strict inclusion and exclusion criteria meant that the study was not large enough to meet the target sample size when confronted with the eligibility issues.

The high disqualification rate and limited timeframe in which the research could be conducted meant that the target sample of 28 usable observations in each group was not achieved. This lack of adequate power limits the results, although the sample size obtained was near to the number of participants in similar research (refer to p. 51).

Most of the postpartum disqualification was due to spontaneous onset labour. This limitation was related to clinical protocol that recommends scheduled caesarean section delivery be performed after at least 39 weeks gestation (NICE, 2004). The guidelines are based on a review of literature that suggests a balancing of foetal development while conducting the deliveries before the spontaneous onset of labour. The data on infant morbidity by gestational age and birth mode are supported by De Luca and colleagues (2009), with subsequent recommendation to restrict the timing and overall conduct of caesarean section delivery. Full-term human pregnancy averages 40 weeks, but many people do not realise that gestation between 38 and 42 weeks is common. Due dates are calculated in various ways and are always estimates.

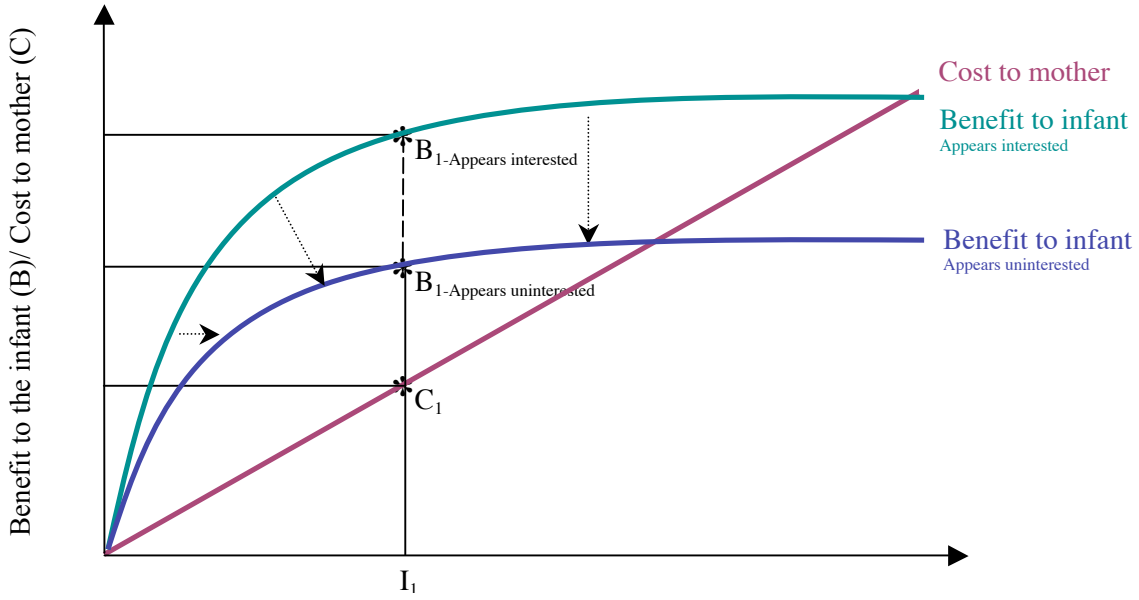
It is estimated that 10% of women go into spontaneous labour during the 39th week of gestation (NICE, 2004). This rate is slightly less than the 14% of my participants who were disqualified from Phase 2 due to going into labour. This is an important aspect not only because of the effect on the sample size I was able to obtain, but also because of the degree to which infants are 'ready' to be born when they are delivered. The stage of pregnancy during which spontaneous onset labour most frequently[1] occurred in England during the study period was during 40 weeks gestation (HES, 2009). However, most caesarean section deliveries were conducted earlier in pregnancy.[2] Overall, the NHS statistics indicate that 55% of spontaneous onset labour occurred at $\geq$ 40 weeks, but only 15.6% of caesarean section deliveries were conducted at these later stages of pregnancy.

Although the timing of delivery by any mode is complicated by the maternal-infant conditions, the data suggest that many infants delivered by caesarean section are born sooner than they otherwise would. This is important with respect to gestational age because Donath and Amir (2008) found that among a sample of 3,600 Australian infants, those born $\geq$ 40 weeks gestation were associated with greater rates of breastfeeding initiation and continuation through six months than those delivered between 37 to 40 weeks. The implications of the timing of delivery are complicated also by the different hormonal and physical circumstances associated with scheduled caesarean section delivery. Difficulties with the foetal transition to extrauterine life arise in Chapter 6, with maternal reports of newborn respiration problems inhibiting breastfeeding.

In addition to the above-mentioned participation issues, the study was affected by the possible impact that the delay in obtaining the side-car crib had in breastfeeding during the observation period. I predicted an increase in breastfeeding due to both the enhanced physical and relational distance compared to the standalone cot. If a mother is impeded from seeing her infant's rooting behaviour, the perceived infant benefit of breastfeeding may decrease. Graph 4.1 models the impact of mother's perception of diminished infant benefit of breastfeeding from lack of infant interest. The line that illustrates benefit to the infant shifts right (it appears as lowered due to the shape of the lines).

[1] Spontaneous onset labour occurred during 40 weeks gestation among 33.7% of women in England. The national data show that labour spontaneously onset at 41 weeks or more with 21.3% of mothers.
[2] In England during 2006-07, 60.9% of caesarean section deliveries were conducted in weeks 38 and 39 of pregnancy, with only 15.6% during week 40 or later (HES, 2009).

Graph 4.1: Theoretical mother-infant health trade-offs for breastfeeding at a certain point in time when the mother perceives an infant as uninterested in breastfeeding.



This maternal perception issue is especially important after a caesarean section delivery because labour and/or delivery anaesthesia affect the newborn (Eltzschig, Lieberman, and Camann, 2003; Montgomery et al., 2006). Jordan and colleagues (2005) found that labour medication was associated with formula feeding and advised the inclusion of 'breastfeeding difficulty' as a recognised side effect of opioid administration. Effects of epidurals on infant breastfeeding are conflicting; with Chang and Heaman (2005) finding no difference in effective breastfeeding at 8 to 12 hours postpartum, but data from Riordan and colleagues (2000) did support impaired infant feeding ability in the early postpartum period. Research by Goma, Said and El-Ela (2008) suggest there are similar effects on infant feeding behaviours after a caesarean section delivery with epidural or spinal block anaesthesia.

My concern that starting the intervention condition at a later time could result in less differential interactions in general, and breastfeeding in particular, is justified by the difference that McKenna, Mosko and Richard (1997) found when comparing mother-infant dyads with their usual versus experimental sleep proximity. They found that routine home bedsharing was associated with more frequent breastfeeding at the sleep laboratory when participants were either bedsharing or sleeping in a separate room compared to those who habitually slept solitary at home. McKenna suggests[1] that there are biological regulatory mechanisms that modulate mother-infant interactions, which, consistent with Hofer's description, are hidden since the effects are largely "unexpected and unapparent without experimental intervention" (Hofer, 1978: 139). Since my study comprised newborns, the processes established through habitual contact had minimal opportunity to develop among any participants since the observation occurred in the second postpartum night. However, Bystrova and colleagues (2009) found that the detrimental impact of a two-hour separation of mothers and newborns immediately following birth was not compensated for by the practice of rooming-in in relation to measured effects in maternal sensitivity, infant self-regulation and dyadic interaction at one year postpartum.

[1] See Trevathan and McKenna (1994), McKenna, Mosko and Richard (1997) and McKenna and McDade (2005).

The delay in side-car crib receipt among some participants was due to a combination of lack of support by certain Royal Victoria Infirmary staff and the practical issue of the distance of the study location from my residence and variable timing of deliveries. Future research of this nature should include a paid hospital staffer to confirm timely side-car crib provision. The problem of adherence to obstetric research protocol was also experienced by Nolan and Lawrence (2009) in a pilot randomised controlled trial among 50 women who had a scheduled 'repeat' caesarean section delivery. Half received an intervention of increased proximity and contact in the operating theatre and recovery room, lasting an average of 113 minutes. A considerable number of their participants (14/50 = 28%) were excluded due to staff being unavailable to provide the support. The researchers concluded that their full study would need additional researchers and funding.

Although a few videotapes were discarded due to being too short, my study supports the ability to obtain accurate data through participant control of the recording process. Although the observations took place on a postnatal ward during night-time, the video camera and the knowledge that their images would be analysed could influence behaviour (refer to p. 37). The relatively few periods of missing data due to a participant halting recording suggest that the filming was largely not perceived as an interruption to breastfeeding. This is important since Morrison, Ludington-Hoe and Anderson (2006) found that the "frequent, erratic and lengthy" postnatal ward activity the day after delivery was described by mothers as being disruptive to their rest and infant care (p. 713).[1] Additionally, breastfeeding in public is often a concern among mothers (Bolling et al., 2007).[2]

The recorded maternal and infant demographics did not significantly vary between the two randomised cot groups, so association of the effect of the cot type on breastfeeding is valid. There was large overlap of the Phase 2 participants between those who were interviewed and filmed. Additionally, the similar characteristics of the sub-samples meant that the interview responses and video observations could be presented together.

Participant demographics

The rate of maternal smoking throughout pregnancy that I found in Phase 1, 14.7%, was similar to the 17% of mothers in England that Bolling and colleagues documented in the 2005 UK Infant Feeding Survey (2007). The association of maternal smoking with infant health outcomes was presented on pages 47-48. Effects were not featured in mothers' perspectives on early breastfeeding. Maternal smoking during pregnancy was an exclusion criterion for Phase 2 to control for these effects when testing the cot types on breastfeeding.

The only recorded maternal or infant characteristic that significantly varied according to whether the caesarean section delivery was scheduled or unscheduled was maternal ethnicity. Asian participants comprised a greater proportion of scheduled caesarean section deliveries, but the small sample size limits inference of the proportions to ethnicity. However, the significantly higher rates of marriage and breastfeeding intent among the Asian participants compared to non-Asian in the sample indicate the women could approach childbirth differently. Bolling and co-researchers (2007) found that Asian mothers in Great Britain initiated breastfeeding more than White mothers, with 94% versus 74% respectively.

[1] See also Dykes (2006) and Odent (2003) for discussion of the importance of maternal feelings of privacy for breastfeeding.

[2] Only 8% of mothers who breastfed in public when by the time their infant was four to six months old reported that they preferred to breastfeed wherever they were instead of going to a designated infant care room. Thirteen percent of women who breastfed in public said that they were made to feel uncomfortable.

The UK National Health Service maternity statistics do not support differential rates of scheduled caesarean section by maternal ethnicity. The data for English hospitals show that 10.1% of birthing women of Asian descent underwent a caesarean section delivery in 2006-07, compared to 13.1% of Black British and 11.5% of White British mothers (HES, 2009). These overall proportions of childbirth mode by maternal ethnicity suggest that the positive association of Asian ethnicity and scheduled caesarean section delivery in Phase 1 occurred by chance. Logistic regression of data from 371,468 Californian women showed that maternal ethnicity was not a predictor for primary caesarean section (Bailit and Love, 2008). These researchers suggest that ethnicity may be important as a marker for other model variables. Callen and Pinelli's (2004) literature review found that various research associated women being married with greater breastfeeding initiation and duration. Because neither the NHS nor the other data investigated maternal ethnicity by unscheduled and scheduled caesarean section delivery, it is an issue that could be investigated in future research. Breastfeeding intent and achievement may be associated with marriage rates because of paternal support for the caretaking strategy.

Breastfeeding intent

Most participants who intended to breastfeed did not state that they intended to supplement from birth, but this may be an overestimation of their actual intent because I did not specifically question if they anticipated providing formula 'top-ups.' The reported plans by Phase 1 women were of slightly more exclusive breastfeeding to those of women in England during 2005. Table 4.4 compares the Phase 1 and England breastfeeding intent.

Table 4.4: Breastfeeding intent in Phase 1 compared to women in England during 2005 (Bolling et al., 2007).

Participants	Ph. 1 *n* = 75 England NHS *n* = 6,075
	n, %
Reported prenatal intent to initially provide breast milk only:	
- Phase 1	49, 65.3
- England NHS	3,706, 61
Reported prenatal intent to initially provide breast milk and formula:	
- Phase 1	4, 5.3
- England NHS	669, 11

Future research could follow up with a question to confirm exclusivity intent with women after they state that they plan to breastfeed. However, this should be done with caution so as not to induce doubt into women's minds about the adequacy of exclusively providing breast milk for their infants' nutrition and/or satiation. My data document how women described their infant feeding plans and illustrate the extent to which early supplementation was on their minds.

Infant health was the most commonly cited reason for breastfeeding intent among my participants and many women also provided a range of self-benefits. The multiple factors for prenatal breastfeeding intent and the primary concentration on infant health were mirrored in English mothers as a whole (Bolling et al., 2007). The Infant Feeding Survey found that 80% of all UK mothers could give a health reason for why breastfeeding was beneficial when specifically asked. The most commonly listed breastfeeding health benefits were building immunity with regards to the baby and losing weight for the mother.

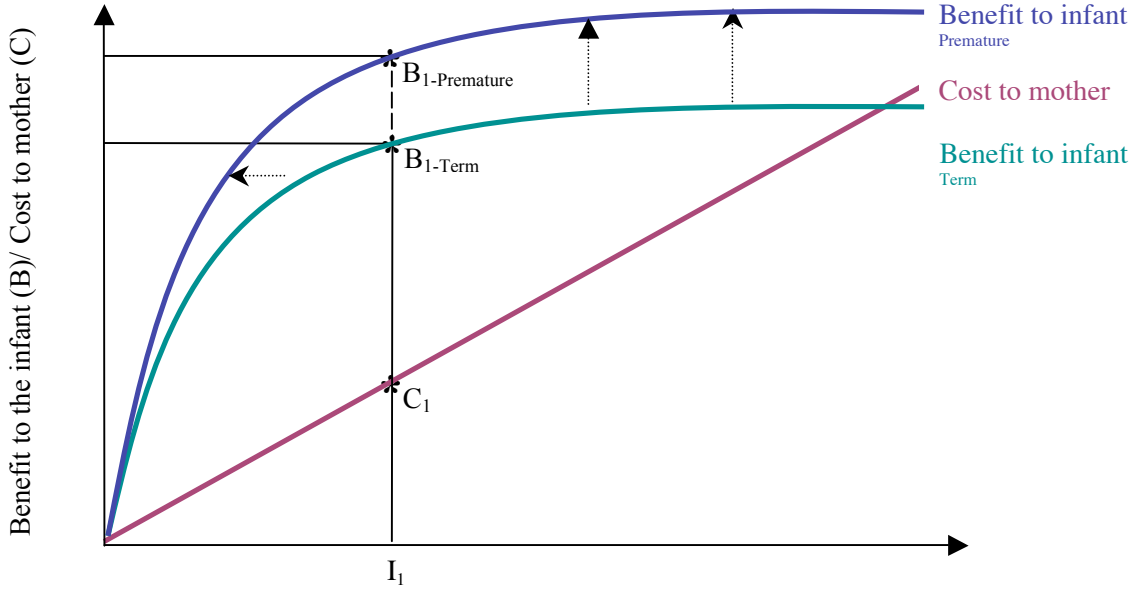
I did not prompt the participants to list breastfeeding benefits or press them for greater specifics. However, I recommend that breastfeeding promotion should not only list the range of health that is influenced by breastfeeding, but also briefly explain why. The

distanced expressions of the breastfeeding advantages could indicate that the women were not fully convinced of the differences between breast milk and formula and/or lactation and bottle feeding. Breast milk may be understood as best, but the state of the evidence is not conveyed if mothers perceive formula as the standard.

Only 62% of the UK mothers who intended to only formula feed could list a health benefit (Bolling et al., 2007),[1] but I would predict that more would perceive medical practitioners as favouring breastfeeding. While most of my participants acknowledged that breastfeeding was encouraged and offered the 'breast is best' slogan, their descriptions indicate that commitment is dependent on their circumstances. Breastfeeding, and doing so exclusively, might be prioiritised by mothers if they had a better understanding of the biological basis of the public health recommendation. Guidelines for infant feeding discussions for health professionals should include specific lists of the physiological facts. For example, the Academy of Breastfeeding Medicine (ABM) suggests the topic be approached by stating "As your doctor, I want you to know that I support breastfeeding. It is important for mothers and babies" (Chantry et al., 2009: 43). The ABM protocol encourages cultural sensitivity, but lacks explicit direction to provide an overview of physiological impacts of breastfeeding/lactation. Breastfeeding encouragement may have an ineffective impact if a woman's understanding of the implications is too vague.

My data suggest that knowledge of the impact of breastfeeding can increase maternal perception of the benefit to the infant. An example is the maternal description of breast milk as being especially beneficial for premature infants. These women described breast milk as a coping mechanism that shifted their willingness to invest in breastfeeding. The theoretical health trade-offs of this scenario are presented in Graph 4.2, with the infant benefit line shifted left.

Graph 4.2: Theoretical mother-infant health trade-offs for breastfeeding at a certain point in time when the mother perceives breast milk as infant coping strategy for prematurity.



From the mother's perspective, an increased benefit to the infant offers greater return for the same level of maternal investment. This was part of the rationale for excluding infants

[1] This is in contrast to 90% of the women who intended to provide breast milk being aware of some health benefits (Bolling et al., 2007).

who received intensive care from the breastfeeding samples.[1] Bolling and colleagues (2007) found that infants who went to the Special Baby Care Unit were more likely to receive breast milk supplementations while in the hospital and had differential (greater) rates of breastfeeding in the first two weeks postpartum than those who had not.

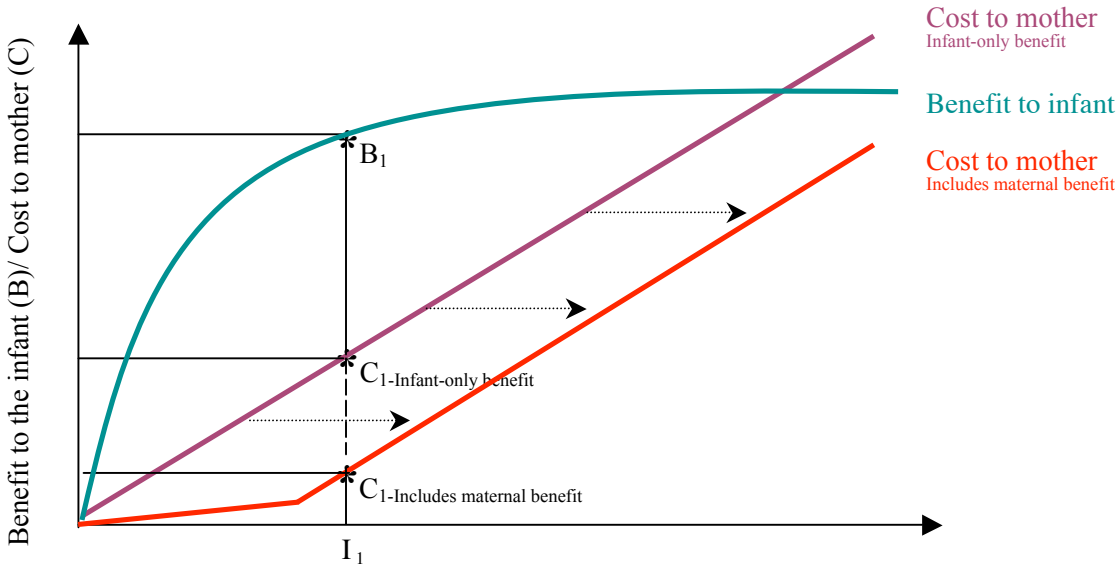
A similar effect of differential perceived infant benefit to breastfeeding was found by Bereczkei (2001). He noted that among babies who were born at a normal weight (>2.5 kg) to first-time mothers, the ones who were initially unwell were breastfed for significantly longer. This finding was not consistent with his prediction of less maternal investment when confronted with infant indicators of 'low survival value.' I suggest that the behaviour was explained by the extra benefits that mothers perceived the disadvantaged infants as reaping from breastfeeding. This fits with Bereczkei's main finding that very low birth-weight infants were breastfed less than heavier babies.

There may be a threshold of health/weight that infants need to meet before mothers (subconsciously) perceive them as benefiting 'enough' for the effort required to provide them breast milk. Bereczkei acknowledges this in his discussion of the life-long disability that some premature infants face. He also notes that the costly care of handicapped children may lead to rewarding "returns on their investment" (p. 209), but reconciles the result by suggesting the mothers continued breastfeeding as they steadily 'tested' the unwell infants until they could accurately assess their health. I would modify Bereczkei's conclusion from "mothers modulate the amount of [breastfeeding] investment in light of their infants' survival value" (p. 207) to "…in light of the degree of perceived infant benefit." Keller, Nesse and Hofferth (2001) similarly conclude that parents should theoretically tend to invest more in unwell offspring based on the marginal fitness gains.

When a mother perceives breastfeeding/ lactation as advantageous for her, the benefit to the infant remains the same, but the cost of providing the breast milk is reduced. Examples include participant descriptions of wanting to breastfeed because of it being a rewarding experience or due to lactation health benefits, such as losing weight. Graph 4.3 models the shift of maternal perception of breastfeeding entailing self-advantages compared to with infant-only benefits.

[1] The other reason for excluding infants who received intensive medical care from my breastfeeding analysis was that their feeding initiated was not able to occur in the same manner (as frequently and/or as much at the breast) as the others.

Graph 4.3: Theoretical mother-infant health trade-offs for breastfeeding at a certain point in time when the mother perceives lactation as conveying advantages for her.



My recommendation for health campaigns to briefly explain the physiological basis for breastfeeding recommendations, especially with regards to maternal benefits, is consistent with the suggestion of van Rossem and colleagues (2009). They found that among 2,914 women in the Netherlands, those women with the highest level of completed education initiated and maintained breastfeeding to two months at a greater rate than those with the least schooling independent of other measured characteristics. The reasons for the relationship between education and breastfeeding intent was unclear. I suggest it may be that mothers who receive more formal schooling have a greater understanding of biological processes and/or the scientific method and so perceive the same prenatal advice as more grounded and therefore meaningful. Alternatively, these women may have the interest and/or means to seek out breastfeeding information more than others. A hypothesis for future research could be: there is a positive correlation in women's perceived benefit from certain breastfeeding advice with their level of their education completed.

The cost-benefit model is applicable for use in underpinning an information-based breastfeeding intervention. Spiby and colleagues (2009) call for theory-based breastfeeding interventions in their discussion of the "urgent need for further research to provide the essential evidence base" for breastfeeding promotion by health-care professionals (p. 11). The potential of improved breastfeeding though enhanced prenatal information is supported by the research undertaken by Shu-Shan Lin and colleagues (2008)[1] and especially in relation to caesarean section delivery by Chien-Hui Lin and colleagues (2007).[2]

In addition to awareness of breastfeeding benefits, my participants reinforced the importance of social influences on their breastfeeding intent reviewed by Clifford and

[1] Ninety-two women in Taipei City either participated in a specially designed educational programme on breastfeeding knowledge, efficacy and skill or (the matched control participants) received usual prenatal care. The participants who received the intervention did not differentially report breastfeeding problems, but were more satisfied with breastfeeding at one day and three months postpartum. Breastfeeding exclusivity was not significantly different between the groups.

[2] First-time mothers who scheduled a caesarean section delivery were either in the experimental group (n = 54) or controls (n = 46). The prenatal intervention was breastfeeding education comprising a booklet, videotape and two telephone calls in addition to the standard hospital care. Maternal breastfeeding attitudes four days after delivery, the rate of postnatal ward rooming-in and exclusive breastfeeding (in hospital and at one month postpartum) were all significantly associated with the education programme.

McIntyre (2008). Few women said that they felt pressure to breastfeed, most had the support of those important to them and all but one knew others who had breastfed. In England, there was a nation-wide positive association between breastfeeding intent and knowing others who breastfed (Bolling et al., 2007). Scott and colleagues (2006) found that mothers who perceived the fathers as having a positive attitude towards breastfeeding were more likely to be breastfeeding at hospital discharge compared to those who considered the men ambivalent or as preferring formula feeding.

Maternal tiredness was a factor spontaneously mentioned into why family members did not support a participant's breastfeeding intent. Nyström and Ohrling's (2004) review of parenting literature identified concordant themes of maternal fatigue, overwhelming feelings of being responsible for the child and struggling with limited time for oneself. They conclude that there is a need for support for parents in coping with the associated strain of parenting. Physical and emotional energy is further discussed in Chapter 8, with regards to maternal tiredness experienced at home from breastfeeding and caesarean section recovery. Fägerskiöld (2008) importantly found that tiredness among new parents was an issue both in itself and as a contributor to adult irritability.

Summary

The conduct of the study suggests future research could adopt digital observation of mother-infant interactions in the hospital setting. Mothers were mostly willing to enrol in Phase 2 and the recording was stopped infrequently.

Greater emphasis of the specific physiological consequences of breast milk/ lactation may assist in cultural construction of breastfeeding value, thereby promoting intent and support.

Both families and researchers should be aware of the commonness of spontaneous onset labour before caesarean section deliveries that are scheduled around 39 weeks gestation. The impreciseness of due dates and the importance of near-term gestation are further addressed in the next results section.

Chapter 5 suggests that the decision for a caesarean section is consistent with what most women, their families and health professionals perceive as necessary given the individual pregnancy/labour circumstances. The data suggest that the variables used to inform the trade-offs are lacking in a physiology grounding and with regards to how the consequences will affect the mother and infant as a dyad.

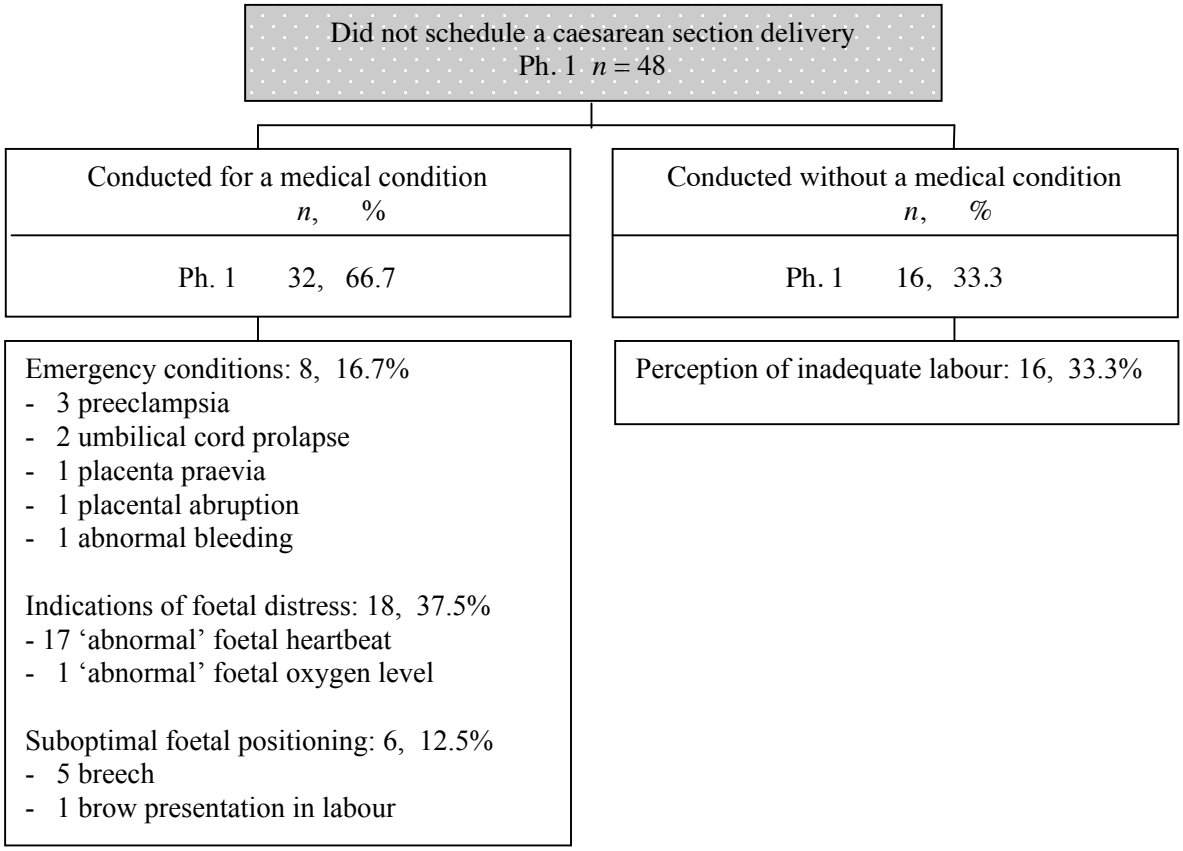
Chapter 5: Maternal perspectives on the decision for a caesarean section

This chapter covers the reasons that mothers reported for the caesarean section, when the decision was made to schedule the delivery and maternal feelings related to their childbirth experiences.

Unscheduled caesarean section delivery

Almost two-thirds of the Phase 1 participants did not schedule the caesarean section delivery.[1] Women reported that these deliveries occurred for a range of medical reasons: emergency situations, indications of foetal distress or suboptimal foetal positioning. The final third of the unscheduled caesarean sections were conducted in the absence of a current medical condition.[2] Figure 5.1 depicts the reasons that mothers provided for the unscheduled caesarean section delivery.

Figure 5.1: Maternal reports of the factors underlying the decision to undergo the unscheduled caesarean section delivery.



The central theme in women's satisfaction was outcome of a healthy infant. Postpartum upset was due to mother's limited ability to manoeuvre and look after the infants as effectively or as much as desired. The urgency with which an unscheduled caesarean section was perceived to be required from the mothers' perspectives ranged from little to grave concern for their and/or foetal lives. Figure 5.3 on page 95 shows that some of the emergency conditions led to unscheduled caesareans conducted without labour.

[1] Of the 75 Phase 1 participants 48 did not schedule the caesarean section delivery (64%).

[2] I categorised "failure to progress in labour" without indications of foetal distress as not presenting a current medical condition. I acknowledge that this explanation is written in medical notes, but it represents a different level of urgency for birth intervention than other indications. The discussion (see p. 108) addresses the perceived need to 'do something' in obstetrics because of the length of time or rate of progress.

Indications of foetal distress

Mothers who experienced an unscheduled caesarean section delivery described belief that the birth would be safe only by this mode due to the circumstances:

> "Baby's heartbeat was dropping, [the caesarean] wasn't planned at all. One minute we were there [in the delivery suite], then had to get her out…had seconds. We didn't have opportunity to discuss it really. I just knew she was seriously distressed. They said [the situation] was life or death and a threat to me as well."
>
> Ph. 1 Part. 37, first time mother who had general anaesthesia with an unscheduled caesarean delivery for indications of foetal distress in spontaneous onset labour.

> "I had been in labour for 12 hours and then his heart-rate started dropping. I didn't understand much at all…never thought would that this [a caesarean section delivery] would happen."
>
> Ph. 1 Part. 3, first time mother who had an unscheduled caesarean section delivery with spinal block anaesthesia for indications of foetal distress during spontaneous onset labour.

However, even in an emergency situation a participant described a level of uncertainty as to whether the caesarean section was required:

> "I was bleeding so I came in and was put on a monitor. The staff weren't happy with the data. They said it was more favourable to have caesarean section than to induce. I had a choice, but was getting vibes from the doctor that it was probably better to go for section. I was not very prepared because I was expecting to try for normal delivery, so it was bit of a shock. I was quite lucky still…it's probably worse for some women who go through labour for long time and then end up having an emergency caesarean."
>
> Ph. 1 Part. 18. She had an unscheduled caesarean section delivery with spinal block anaesthesia for indications of foetal distress without labour.

Perception of inadequate labour

The finding that a considerable amount of participants had an unscheduled caesarean section in the absence of indications of foetal distress suggests that the progress of labour itself can be perceived to warrant a caesarean section delivery:

> "My labour failed to progress after 20 hours. My cervix wasn't dilating. The consultant came in to talk about options. We could've kept trying…" Her husband added, "I was surprised that the consultant said it looks like a caesarean section is right thing to do. He jumped at it. He seemed to care about you [wife], not just as a patient…not just another number. He [the consultant], wasn't trying to keep [caesarean section] numbers down at all costs, he took into account you as an individual. Afterwards, the consultant [came by on the postnatal ward and] said [undergoing the caesarean section] was right thing. It meant a lot, because you always have in the back of mind if you took easy option…copped out. Thinking back, they gloss over caesarean sections in hospital [prenatal classes]. They're so reluctant to give [the operation] because of targets. The 'too posh to push' label is plainly not true…damn media have almost got it [caesarean section deliveries] a bad name."
>
> Ph. 1 Part. 26, first time mother who had an unscheduled caesarean with spinal block anaesthesia for non-progressive spontaneous onset labour.

Participants presented their labour as 'failed' both when it was experienced with and without indications of foetal distress.[1] A caesarean section was deemed necessary due to uncertainty of the effectiveness of the other choices:

> "We just got stuck. I always knew that I might have a caesarean…if [labour] didn't go anywhere. It stopped during my previous delivery as well. I wasn't surprised when they said it. I did have another option, a drip to see if could get further. But, it wasn't guaranteed to work. I'd been in labour 24 hours and would've agreed to anything by then."
>
> Ph. 1 Part. 74. She had an unscheduled caesarean delivery with an epidural for non-progressive induced labour at 38 weeks gestation.

Only one participant mentioned that she felt that the delivery ward conditions affected her labour progress:

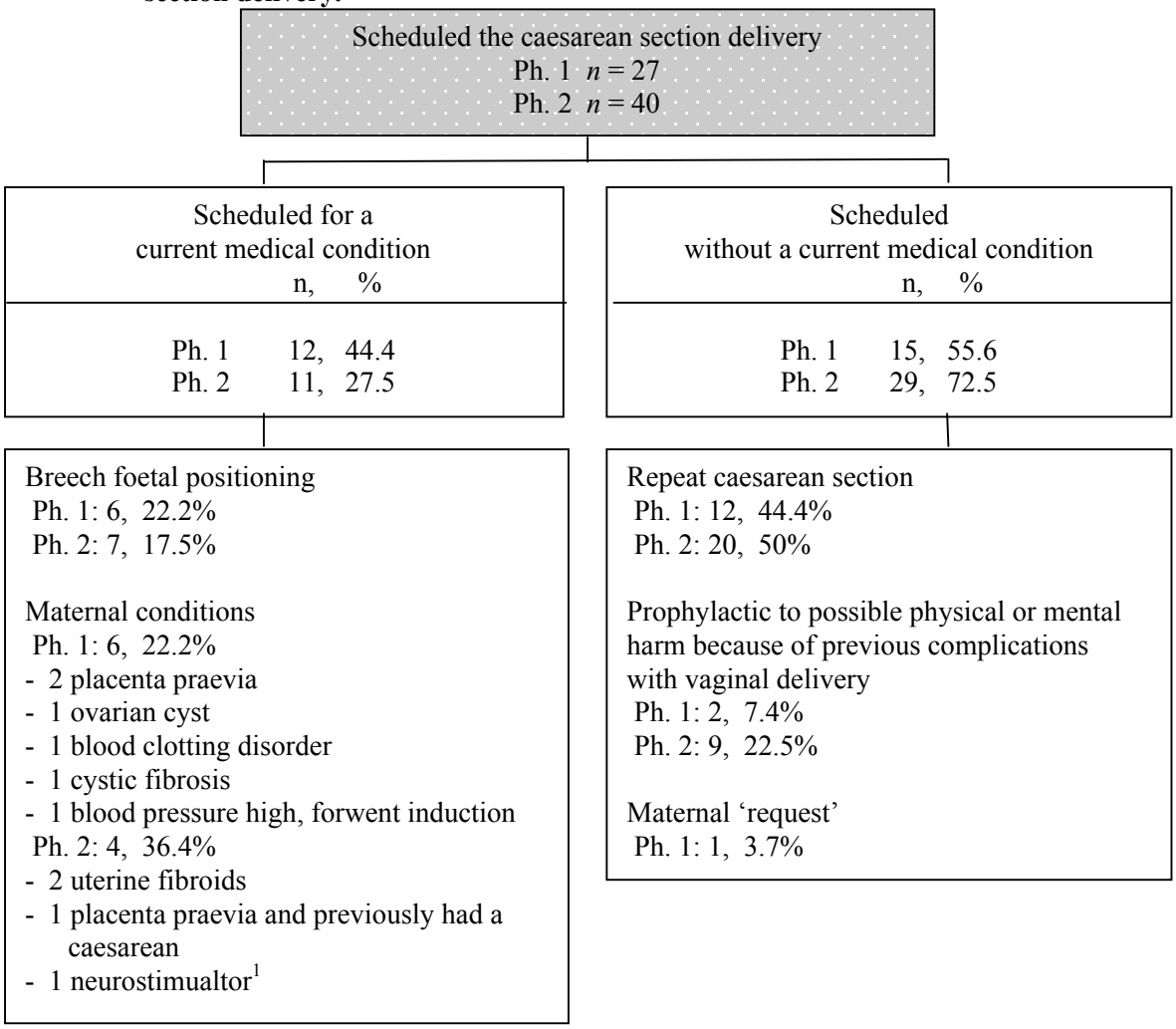
> "My baby was happiest in labour. I didn't want to be monitored continuously…it was disturbing me. I needed to concentrate on the contractions. They checked her heartbeat every 15 minutes. The circumstances could have contributed to the caesarean…everything played some role in that."
>
> Ph. 1 Part. 27.

[1] Labour was referred to as 'failed' by 22 of 48 Phase 1 participants who underwent unscheduled caesarean section delivery (45.8%).

Scheduled caesarean section delivery

Fewer than half of the scheduled caesarean section deliveries were reportedly due to a medical condition currently affecting the mother, foetus or both. Figure 5.2 illustrates the reasons that the mothers reported for scheduling the caesarean section delivery.

Figure 5.2: Maternal reports of the factors underlying the decision to schedule the caesarean section delivery.



Foetal positioning

Participants framed breech presentation as a firm indication for scheduling a caesarean section instead of undergoing vaginal delivery:

> "It's still quite a shock, although I knew [would have a scheduled caesarean section delivery] the night before. I came in to get induced and they discovered that he was breech. I didn't pay any attention [to caesarean sections during pregnancy]…I didn't think that I was going have one. The consultant thought it was best [to schedule the caesarean] and so did we."
>
> Ph. 1 Part. 28, first time mother.

[1] One woman (a 40-year-old first-time mother) had a neurostimulator, which is a surgically implanted medical device used to block the transmission of pain signals to the brain. I did not record the details of her condition so cannot expand on the medical rationale for her contraindication for vaginal delivery. The participant's statement demonstrates that she felt that the neurostimulator was (or represented) the reason for a scheduled caesarean section.

A few participants who scheduled the caesarean section for breech positioning mentioned having been aware of the possibility of prenatally attempting to turn the baby (via an external cephalic version). Two of these three women had unsuccessfully undergone the procedure and recounted that they then "had to opt" for a caesarean section delivery:

> "I never thought I'd have a caesarean. Just sort of skipped through that with the [pregnancy] books. I didn't sort of believe it [when found out the baby was breech]. They tried to turn the baby first, but she wouldn't budge. I was pretty shocked to think I would have to opt for a caesarean…everything went fine through pregnancy and then that. I only found out at 39+2 [weeks gestation] that she was extended breech. They had to get us [booked] in quite fast."
>
> Ph. 1 Part. 55, first time mother.

Some women discussed being resistant to have a caesarean section for breech positioning. These participants thought that a caesarean section should be "a last method thing" but those around the them thought it would be "easier" and "safer."

No participants conveyed breech vaginal delivery as being feasible or having been encouraged by their midwives. Additionally, I witnessed an exchange between a pregnant woman and her midwife when I was recruiting at the antenatal unit. The expectant woman was told that if her breech baby changed position before the scheduled caesarean section delivery, it could be conducted anyway since everyone was planning on it.

Although women recounted caesarean section for breech positioning as the best (or only) option, no specific risks related to vaginal breech parturition were spontaneously discussed.

Maternal medical condition

The maternal medical indications that women cited for scheduled caesarean section delivery were factors that combined with their previous childbirth experiences in deciding to schedule a caesarean section. These participants focused on the certainty of caesarean section delivery and the avoidance of labour:

> "My blood pressure had gone up so he had to come out that day. I could have a caesarean or induction, but there was only a 50/50 chance [of vaginal delivery] with the induction. I could labour for [up to] 8 hours. It was a risk not to have another one [caesarean section delivery]. We left the decision to 36 weeks to see how the pregnancy progressed. My blood was going haywire. The mode of delivery was whatever I wanted to do. They were explicit about the risks."
>
> Ph. 1 Part. 65. She previously scheduled a caesarean for breech positioning but had an unscheduled caesarean section delivery due to spontaneous onset labour. With regards to the first birth, she explained: "I would've done normal [vaginal] delivery if my baby hadn't been breech. I wouldn't be too posh to push."

> "I decided wanted one. I had a caesarean before. I intended on it from day one [of her first pregnancy]. [Her first] delivery was scheduled because my baby was breech. He [previous baby] came before supposed to. I went into labour last time and didn't like it. I'm a coward…I admit it."
>
> Ph. 2 Part. 31. She previously had an unscheduled caesarean section delivery for breech positioning.

Repeat caesarean section

Themes of control, fear and safety in the parturition process emerged from women's spontaneously offered elaborations for their justification of scheduling a caesarean section due to previously experiencing one:

> "I was scared, actually, after having an emergency caesarean with my son."
>
> Ph. 1 Part. 61. She previously had an unscheduled caesarean section delivery for foetal brow presentation in labour.

> "My other child was [delivered via] an emergency caesarean section and they couldn't guarantee vaginal birth [this time]."
>
> Ph. 2 Part. 11. She previously had an unscheduled caesarean section with general anaesthesia for indications of foetal distress in labour.

> "My previous delivery ended up with a caesarean, because of what happened then. The decision was left with me really."
>
> Ph. 1 Part. 59. She previously had an unscheduled caesarean section delivery for non-progressive induced labour.

Caesarean section as a prophylactic to possible physical or mental harm

These women's responses to "what was the reason for the caesarean section" emphasised the prioritisation of avoiding previously experienced childbirth trauma:

> "My first baby was quite big and I had 3rd degree tear [in the course of the vaginal delivery] requiring surgery. [Intending on vaginal delivery again] just wasn't worth it."
>
> Ph. 2 Part. 74. She previously had a vaginal delivery with forceps and her medical notes cited maternal trauma with that birth.

> "I had a traumatic first delivery…a lot of pain. Had forceps [applied during the vaginal delivery], [experienced] incontinence [afterwards] and had a superpubic septum. I had to see a physio for months [afterwards]. This baby is bigger [despite being delivered] three weeks earlier than last one, so I think that I made the right decision. I am uncomfortable now, but [the discomfort is] nothing like last time. I think that I will recover faster this time."
>
> Ph. 2 Part. 65. She previously had a vaginal delivery with complications. Her medical notes cited a third degree tear, urinary incontinence for 12 months and postnatal depression.

Maternal 'request'

The one primipara who scheduled a caesarean in the absence of a medical condition justified her decision in both personal and medical grounds:

> "My caesarean was elective because it's safer [her medical notes stated that she was concerned for the baby]. Also [I was worried about] my high blood pressure and age."
>
> Ph. 1 Part. 1, 34-year-old first-time mother. She also explained that her parents are older and "have forgotten their childbirth experiences." She said that she felt that the midwives know best, which may be related to her entrusting her childbirth to the clinicians. Her medical notes listed her above-mentioned concerns and stated that her blood pressure was not above the healthy threshold.

Decision timing

Although the Royal Victoria Infirmary protocol is to book the appointment for a caesarean section at about 36 weeks gestation, many participants said that their decision was made much farther in advance.[1]

This timing suggests that the caesarean section was decided upon by mothers prior to discussion with medical professionals about the options and clinical trade-offs. Instead, women 'made up their own minds' based on previous experience. The medical notes of some women who scheduled the caesarean section included physician documentation of such discussions that were met with maternal insistence for a caesarean section:

> "From falling pregnant. I was not going to go through what I did last time."
>
> Ph. 2 Part. 48. She previously had an unscheduled caesarean section with general anaesthesia for indications of foetal distress in labour. She added that her latest (scheduled) delivery was "totally different [better] than the previous emergency caesarean section."

> "I wanted to have a caesarean section because my previous delivery was traumatic. I didn't want to go through that again."
>
> Ph. 1 Part. 47. She previously had a vaginal delivery with infant shoulder dystocia.

Characteristics of participants by caesarean section scheduling

The stratified demographics of Phase 1 mothers by whether or not they scheduled the delivery are provided in Appendix G on page 256. The proportion of twin infants, the sex of the baby and whether women included self advantages when explaining breastfeeding intent were not associated with whether the Phase 1 caesarean section delivery was scheduled.

The only recorded characteristic that significantly varied by caesarean section scheduling was the proportion of women of Asian ethnicity. More of the Asian participants scheduled the caesarean section than had intended vaginal delivery. $p = 0.0033$. However, the small number of Asian participants (10 in total) limits inference of the relationship. The Asian women were also more likely to be married and to report prenatal intention to breastfeed than the non-Asian Phase 1 participants, $p = 0.0004$ and $p = 0.0289$, respectively.[2] These p-values were calculated using Fisher's Exact test.

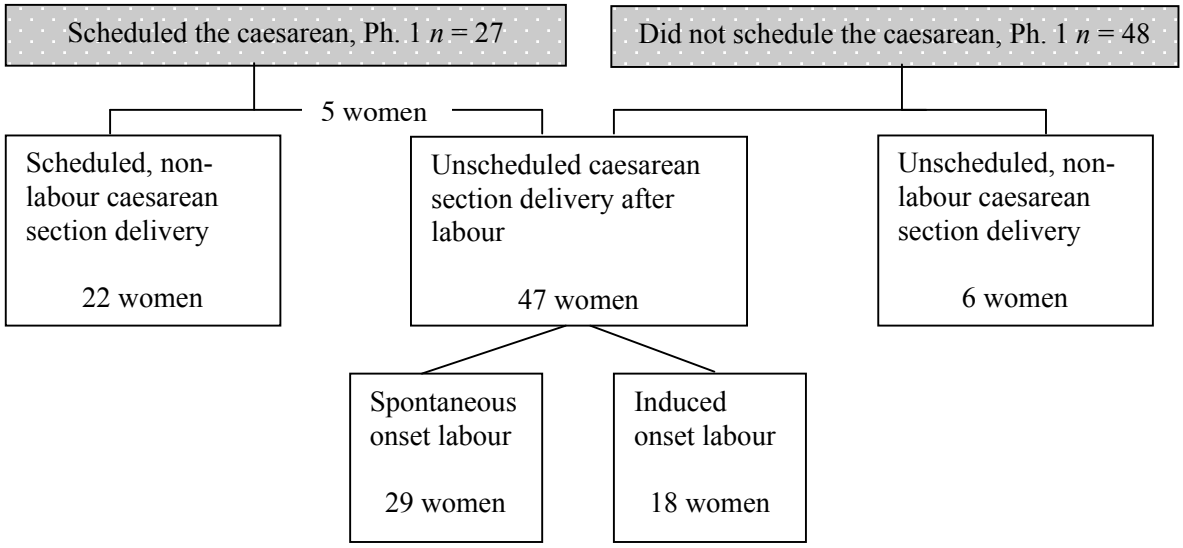
[1] The decision to undergo a caesarean section was mentioned as being made beyond a month in advance of the delivery in 25 of 40 Phase 2 cases (62.5%).

[2] See Appendix G on page 257 for the maternal characteristics by ethnicity.

Caesarean section delivery outcomes

Not all of the scheduled caesarean section deliveries were conducted as planned due to spontaneous onset labour. Figure 5.3 shows the Phase 1 caesarean section delivery outcomes.[1]

Figure 5.3: Type of caesarean sections undergone by delivery scheduling.



Among the few women who had general anaesthesia, the administration was often due to still having sensation after an epidural or spinal block.[2]

Birth companions were most often partners and then the woman's mother or sister. Participants mentioned that some of their partners were upset by the delivery:

> "The way they were tugging her open, it looked like prying a basketball apart. It seemed like they weren't being gentle with the baby….rigorous and rough. But I certainly knew they were in good hands. Men should be prepared…"
>
> Ph. 1 Part. 26's husband who was a first time father. His wife had an unscheduled caesarean section with spinal block anaesthesia for non-progressive induced labour without indications of foetal distress.

> "My partner waited outside [the room]. He didn't fancy the theatre atmosphere."
>
> Ph. 2 Part. 29. She had a scheduled 'repeat' caesarean section with spinal block anaesthesia.

The maternal demographics by the type of caesarean section undergone are presented on page 262, with the infant characteristics on page 263.

[1] The disqualification of Phase 2 participants due to spontaneous onset labour were provided in Table 4.4 on page 69.
[2] Women reported receiving general anaesthesia because of failed epidural 'top-up' or spinal block anaesthesia in 4 of 9 cases (44.4%). One of these women had general anaesthesia without indications of foetal distress.

Maternal feelings

In the operating theatre

In response to "how did you feel when you first saw your infant/s," most said they were happy. Relief was also a common spontaneously offered response. Feelings of being overwhelmed or of initial indifference because of the circumstances were reported by a fifth.[1] Table 5.1 illustrates the themes that I categorised from the maternal descriptions. The feelings were spontaneously offered by participants and not mutually exclusive of each other.

Table 5.1: Maternal reflection on how they felt when first seeing their infants.

Participants	*n* = 75 Phase 1 mothers
	n, %
Maternal feelings:	
- Happy	49, 65.3
- Relieved	20, 26.7
- Overwhelmed	17, 22.7
- Ambivalent	7, 9.3
- Unwell	4, 5.3

"I don't know…it was amazing. I felt relieved. The first thing I asked was if he were alive. He's a proper little baby."

Ph. 1 Part. 32, first time mother. She had an unscheduled caesarean section without labour for preeclampsia. I categorised her response as initially relieved.

"I wasn't able to react basically. There were lots of things going on."

Ph. 1 Part. 1, first time mother. She had a scheduled caesarean section with a spinal block at her request. I categorised her response as initially overwhelmed and ambivalent.

"I was still under the knife, so…"

Ph. 1 Part. 5, first time mother. She had an unscheduled caesarean section with an epidural for non-progressive spontaneous onset labour with indications of foetal distress. I categorised her response as initially ambivalent.

Participants mentioning being overwhelmed, ambivalent or unwell in recalling when they first saw their infants did not significantly differ by whether the women underwent an unscheduled or scheduled caesarean section delivery.[2] However, being awake during the delivery was associated with less mention of these feelings compared to those who had been unconscious with general anaesthesia.[3]

[1] Being overwhelmed or ambivalent upon first seeing one's infant was described by 14 of 75 different Phase 1 mothers (21.5%).

[2] Being overwhelmed, ambivalent or unwell was mentioned by Phase 1 women in 25 of 53 unscheduled (47.2%) versus 8 of 22 scheduled caesarean section deliveries (36.4%), $x^2 = 0.3907$ $df = 1$ p = 0.5319.

[3] Being overwhelmed, ambivalent and/or unwell was mentioned by 25 of 66 conscious (37.9%) versus 8 of 9 unconscious (88.9%) Phase 1 women, p = 0.0085 (Fisher's Exact test).

On the postnatal ward

During the postnatal ward interview, the majority of participants affirmed from a list of feelings that they were happy, relieved and tired. Fewer than half reported feeling well. Almost a third of women said that they were weak, with many explaining that it was because they were exhausted. Table 5.2 presents the proportions of maternal postnatal ward feelings (which were not mutually exclusive).

Table 5.2: Maternal reports of current feelings during the postnatal ward interview.

Participants	Ph. 1 *n* = 75
	Ph. 2 *n* = 39
	n, %
Women's current feelings on the postnatal ward:	
- Happy	65, 86.7
	38, 97.4
- Relieved	59, 78.7
	37, 94.9
- Well	35, 46.7
	31, 79.5
- Tired	53, 70.7
	32, 82.1
- Weak	23, 30.7
	14, 35.9
- Sick	6, 8
	No data
- Depressed	4, 5.3
	No data

The feelings reported from the list did not significantly vary by the type of caesarean section undergone. As would be expected, women whose newborns went to the Special Care Baby Unit (SBCU) were associated with saying that they felt depressed.[1] One of these participants reflected, "the feelings I thought that I would have didn't come straight away."

Other emotions spontaneously offered when I asked if the women "were experiencing any other feelings" were general distress, 'dying to get home,' shaken, drained, frustrated with mobility limitations, anxiety about infant feeding, emotional, 'anti-climax' and in pain:

> "Sore. It is hard to jump to get my baby and I'm upset that [breast]feeding isn't going well."
>
> Phase 1 Part. 63, 28-yar-old White European first time mother who had an unscheduled caesarean with an epidural for non-progressive spontaneous onset labour without indications of foetal distress.

[1] Depression was affirmed by 3 of 9 women whose babies went to the SBCU (33.3%) compared to 1 of 66 participants whose newborn did not receive intensive treatment, p = 0.0047 (Fisher's Exact test).

"I'm anxious because they [twins] aren't [breast]feeding properly. I feel emotional. He sleeps all day and cries all night. It's harder at night, they're very demanding…apparently that's normal."

Ph. 1 Part. 31, first time mother. She had an unscheduled caesarean section delivery for non-progressive induced labour of twins without indications of foetal distress.

"I'm catching up on sleep…she [baby] isn't [breast]feeding very much."

Ph. 1 Part. 19, first time mother. She had a scheduled caesarean section delivery for breech positioning.

I modified the list of postnatal ward feelings between the research phases by replacing sick with ill and depressed with frustration/upset. Table 5.3 shows that a fifth of Phase 2 mothers affirmed feeling frustrated and/or upset.

Table 5.3: Maternal reports of current feelings during the Phase 2 postnatal ward interview.

Participants	Ph. 2 *n* = 39
	n, %
Women's current feelings on the postnatal ward:	
- Ill	4, 8
- Frustrated or upset	8, 20.5

The frustration/upset was explained as deriving from women's limited infant caregiving capabilities because of manoeuvring difficulty:

"I'm frustrated that I can't do everything I want to do for him. I have to rely on other people…not able to pick certain things up."

Ph. 1 Part. 37, first time mother. She had an unscheduled caesarean delivery for indications of foetal distress in spontaneous onset labour.

"Yes [to frustrated or upset] because of the feeding [not going well] and feeling weak…and not being able to care as effectively as think that I might be able to."

Ph. 2 Part. 42, first time mother. She had a scheduled caesarean section delivery for breech positioning.

"Yes [to frustrated or upset] because of the pain. I can't move or take care of my baby very well."

Ph. 2 Part. 43. She had a scheduled 'repeat' caesarean section delivery.

Preparedness for the caesarean section

Some women recalled their caesarean sections being totally unexpected with very little time for explanation, while others had intended on a caesarean section after having previously experiencing the operation.[1] Description of being 'shocked' at the decision was spontaneously mentioned by both women who underwent unscheduled and those who scheduled the caesarean section:[2]

[1] See Appendix G on page 264 for maternal reports of their preparedness to undergo a caesarean section delivery.

[2] In response to "looking back, how prepared were you for the delivery," explicit mention of shock was provided by 5 of 53 unscheduled (10.4%) and 3 of 27 scheduled (11.1%) Phase 1 women. Refer to page 91 for a description of shock in response to caesarean section delivery for breech positioning.

"Not sure anything really prepares you. I went into shock. I knew in my head it was going to happen, but it's different when you actually do it."

Ph. 1 Part. 11, first time mother. She had an unscheduled caesarean section for non-progressive induced labour with indications of foetal distress.

The timing of one unscheduled caesarean section delivery for breech positioning was striking because it was not due to an imminent medical situation or maternal preference:

"Rather than my waters breaking and her [baby] getting distressed, I had a section. I had come in for [an ultrasound] scan and it was quiet in labour ward so they suggested that I have then [near term].[1] It was a shock."

Participant discussions of their readiness to undergo a caesarean involved clinical information, mental preparedness and emotional support during the procedure:

"I knew enough…because it is an emergency you consent to anything. There is a time when you just don't ask questions. [The delivery] wasn't the lovely, holistic experience…it was never going to be after that [baby becoming distressed]. Whilst it was traumatic, I didn't have a level of choice."

Ph. 1 Part. 2. She was induced at 42 weeks gestation and intended a water birth. She had an unscheduled caesarean section with general anaesthesia for non-progressive labour with indications of foetal distress.

"It seems better to schedule a caesarean section then to have an emergency…[that way you can] be informed. They explain every bit, so you feel in control."

Ph. 1 Part. 32, first time mother. She had unscheduled caesarean section delivery with spinal block anaesthesia for preeclampsia.

"I felt fine about the caesarean…felt calm and in bit more control with what going on. Was bit panicky before that. I was always open minded to anything I needed, probably didn't think it would come to that [having a caesarean section]. I was sort of fine about it; felt apprehensive about going into labour. Once I knew that I was going to have a caesarean, felt calm and confident that he was just going to get out then. Before, I didn't feel like it was ever going to happen."

Ph. 1 Part. 63, first time mother. She had an unscheduled caesarean section delivery for non-progressive spontaneous onset labour without indications of foetal distress.

Satisfaction with the birth

Most participants said that they felt very knowledgeable about their caesarean section deliveries.[2] As would be expected, some of the experiences of unscheduled caesareans coincided with mothers feeling that they lacked knowledge.[3] Participant discussion reinforced the importance of needing time to mentally prepare for the experience:

"Half and half. It was a bit too quick. They did explain everything but there was not enough time for it to sink in. There was nothing said about my baby until afterward. I knew he was distressed and that's why I had to have the caesarean."

Ph. 1 Part. 12. She had an unscheduled caesarean delivery with general anaesthesia for placental abruption at 28 weeks gestation.

[1] I do not have data on the calculated gestational age of this infant, but the mother described the caesarean section as having been conducted at term.

[2] I categorised maternal responses as very knowledgeable in 57 of 75 Phase 1 (76%) and 23 of 32 Phase 2 (71.9%) cases.

[3] Statistical analysis is not appropriate to compare maternal knowledge by caesarean section scheduling because of the different nature and timings of the deliveries.

"I was well informed because I knew exactly what [the midwives and surgeons] would do [during the caesarean section] and what comes into play. I always had a lot of support there [while she in the hospital for four and a half weeks prior to her scheduled caesarean section]. I saw moms who had caesareans and saw that were alright."

Ph. 1 Part. 6, first time mother. She had a scheduled caesarean section delivery for placenta praevia.

Delivery worse than expected

In response to "was your delivery better, comparable or worse than you anticipated," participants had mixed replies. The theme in women's experiences was of the delivery outcome of having healthy infants.

The perceived necessity of the caesarean delivery emerged as an important variable into women's birth satisfaction. A lack of decision was beneficial for some in that they did not feel guilty about undergoing a caesarean section, whereas others prenatally had a poor outlook on caesarean sections that they retained postpartum.

The third of participants who described their birth as worse than expected offered a variety of reasons for their dissatisfaction, including lack of control, fear and high levels of postpartum pain: [1]

"Worse. I have a healthy baby, so [the outcome is] what I hoped. I didn't want general anaesthesia though. It was [administered] straight away when they said that we needed a caesarean…took us away. It was so quick…quite frightening."

Ph. 1 Part. 46. She had an unscheduled caesarean section with general anaesthesia for indications of foetal distress in spontaneous onset labour.

"It was worse. I knew it was going to be painful, but didn't think it was going to be like that…"

Ph. 1 Part. 54, first time mother. She said that she had the unscheduled caesarean section delivery because "I could only dilate at four centimeters [during induced labour] and she [the baby] was getting distressed."

Delivery comparison

Participants' feelings of control over the delivery process, time to mentally prepare and maternal pain were themes in how they rated their delivery in response to "do you think that your experience was comparable, better or worse than others." [2]

"Better [than other caesarean section deliveries]…it was more my choice. There were lots of good reasons, but nothing overriding that meant I had to have. It made me feel better about it, [being] my decision."

Ph. 2 Part. 32. She had a scheduled 'repeat' caesarean that she decided beyond a month in advance of the delivery.

"It was comparable [to other caesarean section deliveries]. I was on phone to my sister and she had a section 4 months ago. She said that everything sounded the same. Some women expect it to be easy and it's not."

Ph. 2 Part. 17. She had a scheduled 'prophylactic' caesarean section delivery.

[1] See Appendix G on page 265 for maternal satisfaction with the birth.

[2] See Appendix G on page 265 for maternal perceptions of the delivery compared to others by the type of caesarean section undergone. Women's classification of their experience as worse was not associated with the type of caesarean that they underwent.

"It was worse [than other caesarean section deliveries]. I've been quite upset because I had a bad pregnancy…and then to have that at the end. Some people know that they are going to have [a caesarean section] ahead of time."

Ph. 1 Part. 54, first time mother. She had an unscheduled caesarean section delivery because for non-progressive induced labour and indications of foetal distress.

"It was different [than vaginal delivery]. Caesarean sections are more painful, but I was scared about vaginal delivery and [its associated] pain. I didn't have that [labour pains], but I have more discomfort afterwards. If I had had a normal birth, I wouldn't be in this much pain now and would be able to walk around the room."

Ph.1 Part. 3, first time mother who had an unscheduled caesarean section delivery for indications of foetal distress during spontaneous onset labour.

Postnatal ward pain was mostly rated in the middle of the provided scale[1] and the responses did not significantly vary by whether women scheduled caesarean section delivery.[2]

Most participants did not rate their postnatal ward pain as greater than with vaginal parturition (that they either experienced or perceived) when asked to compare their discomfort to that of others.[3] Women's descriptions of vaginal delivery was that it involved intense but relatively brief pain compared to the controlled but prolonged discomfort of caesarean section delivery:

"Different, it's controlled compared to vaginal [delivery]. Caesarean section pain lasts longer and affects you more…and have to be careful."

Ph. 1 Part. 25. She had a scheduled caesarean section delivery for breech positioning of both of her twins. She previously underwent an uncomplicated vaginal delivery.

"Worse, there's greater [pain] with caesarean because of the longer recovery period. After vaginal delivery you're not restricted to what you can do…for this, are [limited] for weeks and weeks afterwards."

Ph. 1 Part. 37, first time mother. She had an unscheduled caesarean delivery for indications of foetal distress in spontaneous onset labour.

"I would think that there is more pain with caesarean section. You have guaranteed pain with a caesarean. You can get injured or tear with natural [vaginal] delivery but you see [all] people carrying themselves gingerly after a caesarean."

Ph. 1 Part. 44. She had scheduled a 'repeat' caesarean section for her twins, but she experienced spontaneous onset labour and had an unscheduled caesarean.

[1] Maternal postnatal ward discomfort was documented by participants' rating on a scale of 1-5, with 5 being the greatest level of pain. The median level was 2.5 with Phase 1 participants and 2 with Phase 2 women.

[2] The Phase 1 participants who did not schedule (n = 53) rated their postnatal discomfort as 2 with a range of 1 to 5 while those who scheduled the caesarean section delivery (n = 21) rated 3 (1-5). Ratings of greater than 2.5 were given by 20 of 53 unscheduled women versus 11 of 21 participants who scheduled the caesarean section delivery, $x^2 = 0.2497$ $df = 1$ p = 0.6173. The mothers said that their pain was worse than after other caesareans in 8 of 73 Phase 1 cases (11%): with 4 of 51 unscheduled (7.8%) and 4 of 22 scheduled (18.2%) caesarean section delivery, p = 0.2319.

[3] Phase 1 participants rated their pain as greater than vaginal parturition in 23 of 74 (31.1%) cases. Having undergone an unscheduled caesarean was not differentially associated with descriptions of pain as worse to vaginal delivery than those who had a scheduled caesarean: with 14 of 52 unscheduled and 9 of 22 scheduled, $x^2 = 0.2348$ $df = 1$ p = 0.6280.

Language

Approximately half of the participants said that the caesarean section was the "right option" or "turned out to be the best decision" without qualifying their reply.[1] The remainder explained that the decision was necessary at the time or best with the knowledge they had. Women cited serious terms such as danger/safety, exhausting every alternative/refusing previously failed methods, disaster and death, risks and stress:

> "Yes, it was definitely right for my baby…left any longer would've been too dangerous. It is a shame to have gone through such a long labour and then have a caesarean section."
>
> Ph. 1 Part. 11, first time mother. She had an unscheduled caesarean for indications of foetal distress during induced labour.

> "It was bad…a little disaster. But it had to be done because of the known risks."
>
> Ph. 1 Part. 27, first time mother. She reluctantly had an unscheduled caesarean section for non-progressive spontaneous onset labour for a frank breech baby without indications of foetal distress.

> "No for me, but yes obviously under the circumstances. My baby would've been dead if I hadn't…I'm not too posh to push."
>
> Ph. 1 Part. 37, first time mother. She had an unscheduled caesarean delivery for indications of foetal distress in spontaneous onset labour.

> "Yes for me. With my first baby I was stitched inside and out…right mess down below. I didn't like that idea [having vaginal complications again] at all. Yes for my baby."
>
> Ph. 1 Part. 72. She had an unscheduled caesarean section delivery without labour for breech positioning.

[1] See Appendix G page 266 for maternal reflection on the decision to undergo a caesarean section. The unqualified response was distributed similarly between Phase 1 women who underwent unscheduled or scheduled caesarean section deliveries: 24 of 53 (45.3%) versus 8 of 22, (36.4%), $x^2 = 0.207$ p = 0.6493.

Results summary

Most decisions for a caesarean section occurred in the absence of a current medical condition. The terms 'emergency' and 'elective' caesarean were largely unreflective of reality. Unscheduled caesarean was often conducted without indications of foetal distress because it seemed "the best way forward" from "failed" labour. Scheduled delivery was often explained by avoidance of previous trauma, either unscheduled caesarean section or maternal pelvic floor damage. Mothers often decided on a caesarean section months in advance because intending vaginal delivery "wasn't worth it" in the context of their experience. Planning a caesarean section enabled maternal psychological and practical preparation. Undergoing unscheduled delivery without time for it to "sink in" was upsetting, but perceived as required given the minimal "level of choice" the mothers confronted.

Women expressed preference for a "lovely, holistic" experience of uncomplicated vaginal delivery but caesarean section was perceived as safer because it was "controlled." Further, women were scared since vaginal parturition put the responsibility of the delivery on them and the outcome "wasn't guaranteed." Most women undergoing a caesarean section for the first time discussed never having considered it being a possibility. The decision "to have to opt" for a caesarean was "shocking" to some, with many considering it best only because it was perceived as necessary.

Participants described the idea for a primary caesarean section delivery as arising from the midwives/ physicians, but the decision seemed best to the mothers as well because of the "known risks." Although the mothers expressed awareness of the debate into the appropriateness of caesarean section delivery, they framed it as a socially constructed issue of "copping out" by taking the "easier" route. Women justified the decision for a caesarean section in serious terms – including danger, disaster and death – when asserting that they were not "too posh to push." This implied that it was not a decision undertaken casually or without belief that it was the best option given the circumstances. The hospital environment in which labour occurred was brought up as influencing the decision for a caesarean delivery by only one participant.

In addition to happiness and relief, many mothers recounted feelings of being overwhelmed or of initial indifference when first seeing their infants. There were too many "things going on" at the time of delivery, including still being "under the knife," for them to "be able to react" to the newborn.

Women portrayed avoidance of labour as preferable, since it was disappointing to have endured the effort and pain and then end up with a caesarean anyway. Additionally, labour was importantly viewed by the mothers as incurring undo stress on the infant. This perspective could have been influenced by the length of labour and/or change in foetal heart rate with contractions. Those who discussed wanting to avoid labour and/or decision to undergo a caesarean section without indications of foetal distress, seemed to do so with the perspective that it was an equitable birth mode to 'normal' parturition.

Discussion

Unscheduled and scheduled caesarean section delivery

The proportion of caesarean section delivery types that Phase 1 women experienced were similar to the rate of unscheduled and scheduled caesarean section generally for Newcastle upon Tyne NHS Foundation hospitals and across NHS hospitals in England during the study period (HES, 2009). The comparison is presented in Table 5.4.

Table 5.4: Types of caesarean section delivery in Phase 1, Newcastle and England.

Participants	Ph. 1 *n* = 75
	Newcastle NHS *n* = 1,230
	England NHS *n* = 145,051
Type of caesarean section delivery	*n*, %
Unscheduled:	
- Phase 1	53, 70.7
- Newcastle NHS	790, 62.4
- England NHS	88,504, 60.7
Scheduled:	
- Phase 1	22, 29.3
- Newcastle NHS	790, 35.8
- England NHS	56,997, 39.3

The finding that the type of caesarean section delivery in Phase 1 reflects the regional and national trend suggest that the data generated about women's decisions to undergo a caesarean section are relevant to the broader population.

Maternal explanation for the decision to have a caesarean section indicates that the classification system of 'emergency' and 'elective' caesarean section is largely unreflective of women's actual experience. Alternative classification based on the urgency of the caesarean section has been put forward and is promoted by the National Institute of Clinical Health and Excellence (2004), among other public health organisations. The system comprises four 'grades' of caesarean section:

1. emergency, immediate threat to the life of the woman or foetus
2. urgent, maternal or foetal compromise, which is not immediately life threatening
3. scheduled, no maternal or foetal compromised but needs early delivery[1]
4. elective, timed to suit the woman or staff (Lucas et al., 2000: 236).

The description of the type of caesarean section is important for family, medical staff and public perception of the necessity of the deliveries. Although I saw the Grades on some participants' medical notes, I did not record this data because the terms emergency and elective were also used and I had not realised the significance of the numerical codes. At the study hospital, application of the grade-classification system seems to be listing 1, 2, 3 or 4 in the medical notes alongside the traditional reference. The midwifery notebook on the postnatal ward did not specify the grade next to the women's birth descriptions. This system does not seem to effectively convey the circumstances. Adoption of the simpler terminology of unscheduled and scheduled caesarean that I used throughout this thesis may facilitate clearer research and public conceptualisation. This language does not indicate medical conditions or other contributors for the decision to undergo a caesarean section and so more appropriately conveys the general circumstances.

Authoritative knowledge

The decision to have a caesarean section delivery seemed like the only option to most participants, given the known trade-offs in their circumstances. Most women did not regret the decision to undergo a caesarean section, but lamented that it was necessary. Those who were unsure if the delivery mode turned out to be the best cited unanticipated harm incurred, primarily in the form of infant respiratory difficulty and subsequent breastfeeding problems.

[1] Future research could investigate the extent to which the 'early delivery' terminology is used and/or meaningful among obstetricians, midwives and families. Lucas and colleagues explain that their definitions are based on anaesthetic urgency, not the medical need to circumvent vaginal delivery.

The indication for caesarean section delivery was generally perceived to be firm, although situations such as vaginal birth after caesarean section (VBAC) and breech vaginal delivery are debated in the literature (see van Roosmalen and Rosendaal, 2002; Landon, 2008). One of the reasons that caesarean section may be presented as the safest course of action is that physicians trained in these particular circumstances are uncommon. The largest study comparing neonatal outcomes after caesarean section or vaginal delivery for breech presentation included the mandate that study locations had an:

> experienced clinician…someone who considered himself or herself to be skilled and experienced at vaginal breech delivery, with confirmation by the individual's head of department (Hannah et al., 2000: 1376).

If maternity units do not have staff who meet such descriptions (because of limited training, low staffing levels and/or a rural location), then it is reasonable to conclude that vaginal delivery is not overall safer than caesarean section.

United Kingdom policy is to offer external cephalic version for breech positioning and to recommend caesarean section if turning the foetus head down is contraindicated or unsuccessful (NICE, 2004: 9). The policy is to support women's decision for VBAC, but the document does not advise specialised maternity professionals. Instead, the guidance is that electronic foetal monitoring be offered and the labour occur in a unit with the capacity to immediately conduct a caesarean section (p. 23). This background may reflect the "vibes" at the study location that caesarean section was the better choice in circumstances of suboptimal foetal positioning or women having previously experienced a caesarean section. Families should be aware, however, that this may in part be due to the context of their birthing setting, not the mode's inherent appropriateness.

A particularly important finding is that both unscheduled and scheduled caesarean section deliveries were reported by mothers to be conducted in the absence of a current medical condition. The rationale for a caesarean section delivery was described by these mothers as having been agreed upon between themselves and their caregivers. This mutual perspective is consistent with the concept of authoritative knowledge (Jordan, 1993). The circumstances that 'counted' towards the decision for a caesarean section, such as 'failed' labour or prioritisation of avoiding previously experienced harm, were influential regardless of the indications' "truth value" (Jordan, 1993: 149).

A third of the unscheduled caesareans were described as due to 'failed,' 'non-progressive' or 'stopped' labour in the absence of indications of foetal distress. I did not collect data on the duration of the labour stages; it was the maternal perception of the reasons for the caesarean section that I was investigating, not the medical legitimacy of the reasons. A limitation of the study is that the duration of women's 'prolonged' labour could have ranged widely. Regardless, indication for and conduct of unscheduled caesarean sections were attributed to lack of labour progress. Despite clinical guidelines recommending pharmacological augmentation of labour in these circumstances, 1 in 5 women in the UK do not receive it before a caesarean section is offered (Saxena and Lyons, 2002).

'Abnormal' labour is the most common indication for primary caesarean section delivery (Mancuso and Rouse, 2008). In investigation of caesarean section delivery in Britain, Churchill, Savage and Francome (2006) asked mothers "what reason/s did the doctors give for performing a caesarean operation" (p. 129). The most common response for unscheduled caesarean section mirrored my findings of labour 'taking a long time' or foetus becoming distressed. Mancuso and Rouse (2008) reviewed data on maternal and infant health after various durations of labour and found that, in the absence of indications of foetal distress, there was no association between relatively prolonged labour and

detrimental health outcomes. They conclude that the legacy of the Friedman labour curves[1] unnecessarily promotes caesarean section intervention for 'non-progressive' labour.[2]

This issue is particularly striking because a few women underwent unscheduled caesarean section with general anaesthesia because of still feeling sensation after epidural or spinal anaesthesia administration. One of the participants did not experience indications of foetal distress. General anaesthesia renders a person unconscious and is vital in emergency situations, but mothers miss out on the delivery and describe more negative feelings when recalling first seeing the newborns. The risk of maternal complications, including mortality, is greater with general anaesthesia compared to regional anaesthesia in childbirth (Eltzchig, Lieberman, and Camann, 2003).

Intervention based on women's 'problematic' labour may be a consequence of a misunderstanding of labour physiology and the tendency for Western, technological medicine to be perceived as offering control over (and therefore improvement on) 'unpredictable' natural processes. Davis-Floyd (1993) and Martin (1991) have discussed how, in the 'technocratic' model of medicine, female biological processes are viewed as inherently subject to malfunction. Ingrained biases arise from discriminatory terminology such as 'failed' labour and contribute to the ways in which both medical staff and women approach childbirth. Martin (1991) states "medical culture has a powerful system of socialization" when describing that ideas of women's ability to give birth, for example, are common in popular culture, among families in clinical settings (p. 13). She asserts that it is difficult to be aware of cultural influences on the way we perceive 'medical events' because "we tend to think of science as outside of culture because it seeks the truth about nature" (p. 22).

Various anthropologists[3] cite the influence of Descartes and other 17th century philosophers as initiating the view of the human body as separate from the mind and therefore functioning as a machine. The history of philosophical contributions to biological reductionism, perception of nature as chaotic and interventionist medical practice are detailed by Merchant (1980). When viewed within a cultural framework that values technology and presents childbirth as a medical or even dangerous condition, caesarean section is a logical intervention when labour deviates from 'normality.'

My data suggest that the decision to have a caesarean section is made because of maternal and caregiver *experience*, not necessarily optimum practice based on parturition physiology. Jordan states that authoritative knowledge is constructed because it explains "the state of the world better for the purposes at hand" (1993: 152). If women are unaware of the benefits labour provides for infants' transition to extrauterine life then it would be difficult to explain why they should experience any or especially 'prolonged' labour. If midwives do not perceive of epidurals and/or the lithotomy position as inhibiting labour progress, then it is hard to imagine them continuing to support those whose labour "just doesn't go anywhere." Even if the impact of the technological intervention is understood and if women are unable to receive continuous emotional support then the technological intervention may offer reassurance. Trevathan (1987; 1997; 1999; 2007) hypothesises that, because of the various anatomical constraints in human childbirth (refer to pp. 11-13),

[1] Friedman (1954) plotted centimeters of cervical dilation against time in a hospital setting to document the 'normal' pattern. The research was seminal in obstetrics and remains influential for determining the typical thresholds for medical intervention (Downe and McCourt, 2004). However, the findings have been repeatedly discredited as generalisable or physiology-based. See Schiff and colleagues (1998), Zhang, Troendle and Yancey (2002) and Cesario (2004).

[2] Mancuso and Rouse (2008) recommend revised guidelines for the appropriateness of medical intervention in labour without indications of foetal distress. The management compares past Western practice with specific new definitions (p. 488).

[3] See Martin (1991), Davis-Floyd (1993), Trevathan (1997) and Dykes (2006).

mothers tend to seek companionship during labour to ease their anxiety. This evolved desire for support may be maladaptive in some modern contexts when the routine companionship offered is an electronic foetal monitor.

Participants generally described their ideal delivery as lovely, holistic and vaginal. However, after experiencing 'emergency' caesarean section or pelvic floor damage, women receiving the option of a scheduled caesarean section understandably wanted to have the "safer" and more predictable experience. Fisher, Hauck and Fenwick (2006) discuss that culture influences not only how women perceive childbirth as an event, but also how they experience the process. These authors posit that ideas of control and risk form the foundation for views on the appropriateness of technological intervention. My data suggest that women's prenatal conceptualisations of things likely to go wrong with their deliveries influence their feelings on childbirth intervention. Therefore, future research could measure the effect of postpartum reflection between midwives and families about the birth and what could be done to alter the course of events in subsequent deliveries.

Mischaracterisation of maternal request for a caesarean section

Previous research into caesarean section decision-making has included phrasing such as "did you ask to have a caesarean section?" (Churchill, Savage, and Francome, 2006: 131). This questioning technique reflects the traditional classification of 'elective' caesarean section and not whether women were the first to bring up the caesarean section possibility because they felt is was necessary in the circumstances or the best option in balancing the known costs and benefits. If studies use a survey format or frame interview question in this type of manner, the data do not contribute to understanding the complex reasoning underlying the decision for a caesarean section. Although Churchill, Savage, and Francome equate the proportion of their respondents who "asked" for a caesarean section as "requesting" the procedure, they did follow up into why the women did so. Unsurprisingly when compared to my results, the "desire to pre-empt the need" for unscheduled caesarean dominated responses (p. 131).

A tenet of authoritative knowledge is that some kinds of knowledge become "discredited and devalued, while others become socially sanctioned, consequential, even official" (Jordan, 1993: 150). The short- and long-term risks of caesarean section delivery may be regarded as unlikely to actually affect women and their infants, whereas previous infant death or maternal pelvic floor tearing was a lived experience that becomes justifiable for a caesarean section when the consultant agrees to conduct one on this basis and records this on the medical notes. Churchill, Savage, and Francome (2006) advise better prenatal and intrapartum support for women to so that they better understand what is happening to them and to enable more informed choices.

The decision to schedule a caesarean section without a current medical condition was maximising maternal and/or infant well being from the participants' perspectives. There was no definitive reason for them to think that their outcomes would be different than before and so the decision for a caesarean section was about cost minimisation. Women expressed knowledge of the surgical risks and postpartum pain, but not consequences of the absence of labour or breastfeeding obstacles.

When the importance of foetal development in the final stages of gestation,[1] the impreciseness of due date calculation, the range of normal gestational length and the intrauterine preparation for extrauterine life is not presented to/ understood by families, then the decision for a scheduled caesarean section delivery is understandable. If a mother perceives caesarean section as: preventing a specific, previously experienced harm to herself; unlikely harm to the infant (acknowledgement of surgical risks); incurring low risk of surgical complications for herself; and associated with low rate of subsequent stillbirth or placental abnormalities, then a cost-benefit framework can a useful tool to predict her birth mode decision-making.

Obstetrics is a unique medical specialty because it does not primarily deal with pathology. The tendency to suggest intervention in childbirth has been attributed to defensive medicine (Hemminki, 2006). Davis-Floyd (1993) suggests that most obstetricians are sued because of the under-use of technology, not its overuse. Doctors are trained "to do something" (Eisenberg, 1988: 488), but improved prenatal information for families, especially those without the means to research the topics independently, may ease the cultural pressure on maternity workers to recommend intervention in conditions of uncertainty.

If especially women, their partners and their mothers were aware of the physiological mechanisms of labour and the physical benefits usually incurred for infants (refer to pp. 21-24), then consent and refusal could be more informed during childbirth. Extending the decision-making to families in this manner could lead to them to seek more biologically appropriate labour support and also minimise postpartum dissatisfaction. I would expect that the participants in my study who had an unscheduled caesarean section for 'failed' labour would disagree with my assertion that the decision for delivery was made in the absence of a current medical condition. The appropriate length of the various labour stages may be reduced in the mind of families and their caregivers because it is often altered or terminated after a certain point. Normal parturition then may be perceived as what is experienced by those with whom one is familiar, not the range experienced in the broader view of the human species.

Alternative hypotheses: Impersonalised and/or unethical medical practice

My data did not support the assertion that expectant women felt as though they were treated like part of a 'factory production line,' with impersonalised support (see Kitzinger, 2006; Dykes, 2006). Instead, some women specifically mentioned that the consultant "took you into account as an individual" and that the experience was as positive as possible with the surgical atmosphere. The participants did not feel as though a caesarean section was forced upon them or, as concluded by Potter and colleagues (2008) that the medical staff embellished the medical conditions in order to persuade the families to undergo the more institutionally convenient caesarean section delivery.

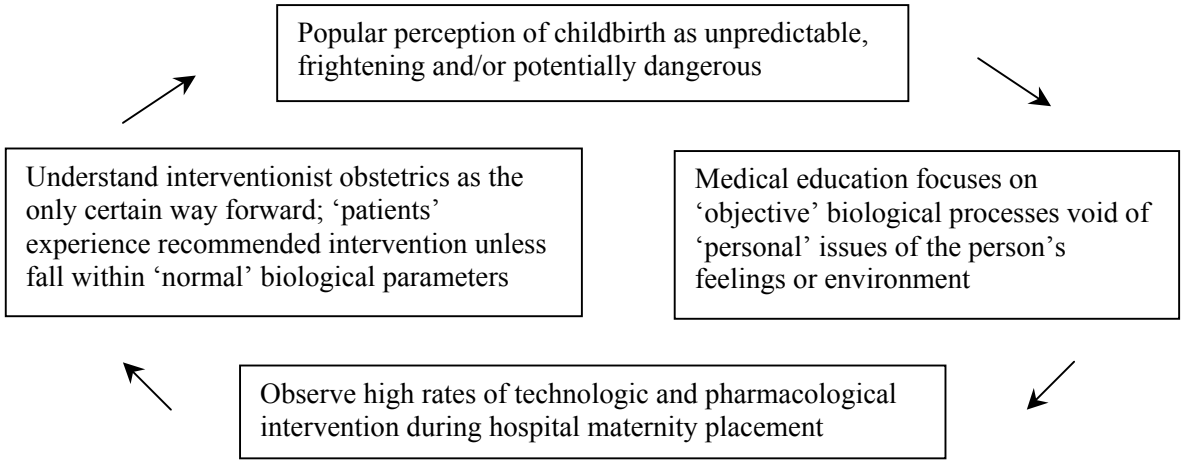
Potter and her co-researchers conducted a study in Brazil (n = 1,136 women) that involved structured interviews with participants prenatally and postnatally in four cities to document their birth mode preferences and actual experience. They found that 72% of private sector hospital and 80% of women in publicly funded hospitals wanted vaginal delivery, but 72% and 31% had a caesarean section respectively. The authors stratified the maternally

[1] Engle and Kominiarek (2008) summarise data on the iatrogenic prematurity incurred by scheduled caesarean section delivery. They limit the definition of 'early term' infants to those 37 + 0 to 38 + 6 weeks gestation; I would extend their examination into all infants delivered (by caesarean section or via induction) before spontaneous onset labour. Engle and Kominiarek present Naegel's rule for calculating due dates, which is they describe as accurate to 1-2 weeks because of variability in menstrual cycles, the timing of ovulation among women. Therefore, I suggest families be cautioned that a scheduled caesarean section at 39 weeks gestation could effectively cut short that infant's intrauterine development by one month (it is possible that that baby would have experienced labour onset at 42 weeks gestation, which could be two weeks later than calculated).

reported reasons for caesarean section delivery into the categories of 'no medical indication,' 'unjustified medical reason' and 'real medical reasons.'[1] The researchers' suggestion that in private Brazilian hospitals, doctors must have (unethically) manipulated women to "renounce the possibility of having their preferred type of delivery" (p. 38) is based on the their assessment of the "plausibility of the reasons" (p. 36) compared to what would be expected "on the basis of a normative probability of 0.04 and a binomial distribution" (p. 37). This analysis does not enable to reader to understand how the authors based their conclusion on the data. Potter and colleagues defend their interpretation by suggesting that it is unlikely that a mother would report a medical reason for her caesarean section if one had not been given and therefore the two possibilities for the outcome are defensive practice or malfeasance derived from "a paternalistic attitude" (p. 38) and/or desire not to interrupt "office hours and academic or social activities" (p. 39).

Potter and her colleagues suggest that there is a dominant perspective that caesarean section delivery is safe, in Brazil and beyond, compared to the potential danger of vaginal delivery for the infant. They dismiss the idea that the physicians were uncertain of diagnosing foetal complications due to the fact that they were practicing in urban locations in which they should have sufficient experience. What is missing from this discussion is the context in which medical professions are educated and subsequently practice. Davis-Floyd (1993; 1998) describes a cycle of technology-based care that begins in medical training and is reinforced through example in practice. The main problem, according to Davis-Floyd and St. John (1998) is that medical training often decontextualises pathologies from the circumstances in which (and people for whom) they are experienced. Chalmers (2006) also questions if doctors are actually aware of the latest evidence. I would suggest that, like the model of solitary and uninterrupted infant sleep that has become dominant in European-American culture (McKenna and McDade, 2005: 137), the decision for a caesarean section seems necessary to all involved in many situations because of a culturally-constructed cycle. Figure 5.4 illustrates the cycle of high rates of intervention in childbirth.

Figure 5.4: A cycle of childbirth intervention as 'normal' and best practice.



This model of birth illustrates what Jordan describes as the "ongoing social process" that results in all participants viewing the current system "as natural order" (1993: 152). Authoritative knowledge is powerful because it is mutually constructed and reinforced. Similar to the goal of the Baby Friendly Hospital Initiative to provide evidence-based postpartum support conducive to breastfeeding, the newly established Coalition for

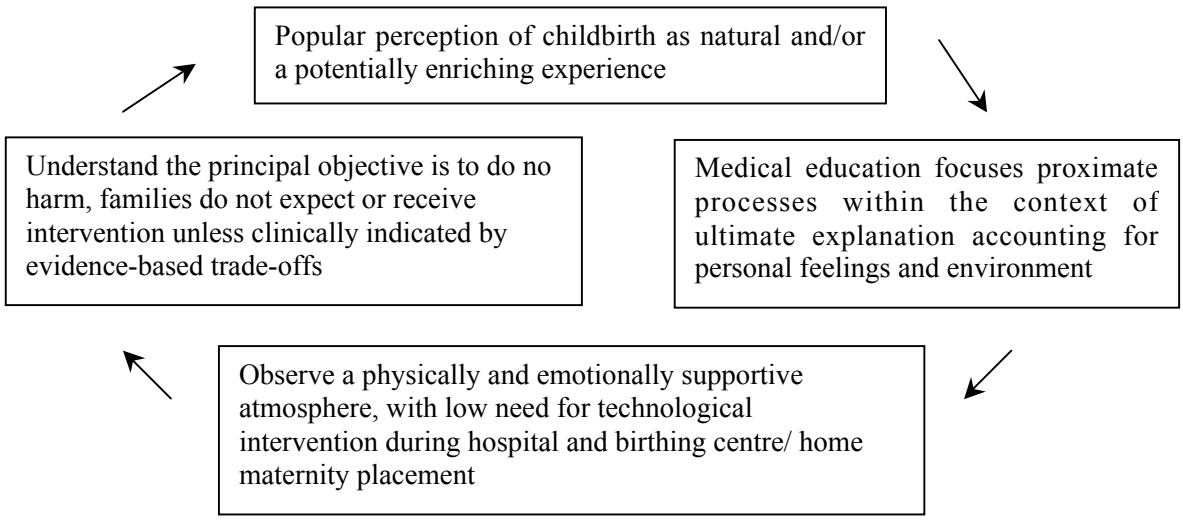
[1] Their constructed categories were defined as no medical indication: physician and/or maternal convenience; unjustified medical indication: problems in previous pregnancy, disease and conditions, such as post-dates, that could be handled through induction; real medical reasons: narrow pelvis, chronic foetal distress, breech presentation, twins, previous caesarean. Potter and colleagues do not acknowledge that their classifications of medical indication could be contested.

Improving Maternity Services (see CIMS, 2007) aims to improve maternity services to be more mother-friendly. Implementation of the CIMS ten steps is designed to 'normalise' the process of birth, empower women to feel confident in their ability to birth and establish periodic review and evaluation among caregivers.

In both humans and other primates, the environment can alter the progress of labour up to a certain point (Smith, 2007), but sensitivity to stress, light, positioning and other distractions is widely unacknowledged (Odent, 2004). Only one participant mentioned the context in which she laboured as affecting the decision for a caesarean section. The effect of the hospital and women's feelings could have been important for others without them realising.

Incorporation of an evolutionary perspective with better physiological explanation may contribute to the "sane understanding of the nature of birth" called for by Odent (2004: 23). I interpret Odent's use of "sane" as meaning recognition of the mammalian norm of the physiological process of parturition. Elton and O'Higgins (2008) discuss how an evolutionary framework could fit within medical education and Nesse (2008a; 2008b) emphasises the potential usefulness of this implementation. Figure 5.5 is an example of reiteration of childbirth as a normal, evolved process with a non-interventionist approach.

Figure 5.5: A cycle of childbirth as 'normal' and best practice.



Jordan's concept of authoritative knowledge can be easily misconstrued as meaning the information held by those in hierarchical positions. However, she explicitly states that this is not what she means (1993: 53). The data from Phases 1 and 2 indicate that the decision for a caesarean section delivery was consistent with a technology-based system in which all of those involved focus on specific known risks instead of the interrelated human physiology of birth and breastfeeding.

Maternal fear of childbirth

Fear of childbirth has been described as clinically significant and a neglected dilemma by researchers who document the high rates of caesarean section delivery. Laursen, Hedegaard, and Johansen (2008) found that among 30,480 Danish women expecting their first baby who completed two computer-assisted telephone interviews, self-rated health was the most important risk factor for fear of childbirth, followed by lack of a social network, an unskilled job or vocational education, being a current smoker, young age and unemployment. Measures of antenatal maternal anxiety have been inversely associated with first-time mothers' confidence in their ability to cope with childbirth (n = 35) (Beebe et al., 2007). Fisher, Hauck and Fenwick (2006) identify that in addition to prospective fear

(of unknown, pain, losing control and/or well being of offspring) an important element of childbirth fear is retrospective due to previous traumatic experiences. This combination was evident in my participants' descriptions. Women largely felt caesarean section delivery was a safer, controllable method although it would lead to "debilitating" postpartum pain. Their priority was to avoid their previous experience because, based on their knowledge, it "wasn't worth it."

Scheduled caesarean section delivery was largely preferred among the participants so as not to 'waste' effort in labour that would end up with a caesarean section and because planning could enable them to be more mentally prepared for the delivery. Byanton and colleagues (2008) similarly suggest that women "having a planned cesarean want to have a pleasant and satisfying experience, which may be different from a previous experience" (p. 31). These authors present the findings that, based on standardised questionnaires completed within 48 hours postpartum (n = 652 women), women's awareness during delivery, relaxation and feelings of control were the most important factors in their birth experiences. Women in my study described narration during the caesarean section as helpful with regards to these aspects of their experiences.

Waldenström, Hildigsson and Ryding (2006) found that women who had "very negative feelings" about childbirth in the second trimester, as concluded from a standardised scale, were more likely to schedule a caesarean section than those who did not indicate very negative feelings, $p < 0.001$, (n = 2,662 total participants, 97 of whom were defined as having experienced the highest degree of childbirth fear). The researchers also found that a greater proportion of the multiparous women who were very negative about the birth had previously undergone unscheduled caesarean section delivery. Waldenström, Hildigsson and Ryding conclude that from the maternal perspective, the experience of childbirth is more important than the mode of delivery because women who had counseling had both higher rates of scheduled caesarean section delivery and better ratings of the birth experience than those who did not spontaneously undergo counseling. The degree of confidence in realising vaginal delivery was found by Stoll and colleagues (2009) as a predictor of non-pregnant women's 'preference' for caesarean section.

Maternal perception of childbirth pain

Declercq and colleagues (2008) cite a gap in the literature about the perceptions of women who undergo caesarean section delivery. They pose the following questions for future research:

- Do mothers think of a cesarean section as pain-free delivery?
- Do they hope that post-cesarean pain will be shorter in duration or less intense than that of labor?
- They may expect that post-cesarean pain will be more manageable or that they will have access to more reliable pain relief than they would with labor.
- Perhaps, with all the focus on labor pain, they simply do not consider the challenges associated with postpartum recovery from abdominal surgery (p. 23).

My data contribute to the relationship between maternal perception of caesarean section and vaginal delivery pain and their birth mode intention. Although some women were happy to avoid labour pain and the level of postpartum pain after a caesarean section was worse than anticipated, the discomfort was not a primary motivator for the decision. The finding that the reported level of postpartum pain did not vary by the type of caesarean section delivery undergone is consistent with the results of Karlström and colleagues (2007).

Women framed caesarean section versus vaginal delivery as influencing the timing of their discomfort (brief and intense with the possibility of long term complication compared to guaranteed, long lasting but controlled); caesarean section was not perceived as being "pain-free" or "easier." My participants described the experience of caesarean section as affecting their postpartum mobility, but those who had experienced pelvic floor tearing or other complications with vaginal delivery said that the postpartum caesarean section pain was not as bad as what they had experienced before.

Those participants who cited infant health as the main determinant of their caesarean section delivery described their own suffering as worthwhile for the sake of their baby. The language that some women used portrayed their births as everything that they had wanted to avoid, but too dangerous not to undergo. In both my study and that conducted by Churchill, Savage and Francome (2006), women defended themselves against the label of being 'too posh to push.' Their experience was not something that they desired; it was sometimes traumatising and resulted in postpartum frustration because they felt unable to interact with their infants as they would like. The impact on infant health was also distressing, which is presented in relation to breastfeeding in Chapter 6.

Although most participants affirmed that they felt happy on the postnatal ward, their first encounters with their infants had been marred by the circumstances. General anaesthesia was particularly associated with feelings of being overwhelmed, ambivalent to the infant and/or unwell. These emotions may sound pathological to some, but Trevathan has asserted that delay in maternal bonding with her infant has been adaptive throughout our evolutionary history (1987). She argues that high levels of infant and maternal mortality prevailed until the relatively recent advances in nutrition, hygiene and medical science, so it would be in women's best interest (with regards to inclusive fitness) to withhold investment until they felt capable and it seemed likely their infants would survive (pp. 231-232).

Trevathan (1987) frames mother-infant interaction as a learned process that begins at birth, which is important during the immediate postpartum period partly because it is valuable experience itself. She discusses that immediate mother-infant contact was critical for newborn survival in our formative past but that modern, technology-based settings eliminate the necessity of "biological mothers" (p. 215 and p. 233). Although immediate maternal joy, physical contact and breastfeeding are not vital for infant survival in some current settings, early mother-infant skin-to-skin contact versus separation is associated with differential dyad interaction and infant self-regulation at one year postpartum (Bystrova et al., 2009).

The perspective of caesarean section as the optimal birth mode in a variety of non-medically indicated circumstances can be summarised as méconnaissance or misrecognition (Bourdieu and Passeron, 1990). The translator to Bourdieu's introduction of this 1990 edition to Bourdieu and Passeron's 1977 publication explains that misrecognition is meant as the process of social interactions "not for what they legitimately are but in a form which renders them legitimate in the eyes of the beholder" (p. xxii). Jordan (1993; 1997) cites this concept as occurring in the technology-based distortion of human birth, which makes the realisation of different maternity care "unthinkable" (Davis-Floyd and Sargent, 1997). Women and their caregivers are doing all that can be done to minimise mother-infant health trade-offs associated with birth modes, but Chapter 6 shows that there are some consequences of caesarean section intervention on breastfeeding that should be factored into the decision-making. Caesarean section, especially when conducted in the absence of labour, is not equitable to the evolutionarily expected human parturition involving spontaneous onset labour and vaginal birth.

Summary

This chapter suggests that perspectives of the appropriateness of caesarean section delivery are mutually constructed. Alteration of the ways in which we refer to caesarean sections may promote discussion of the biological rationale for the procedures. Public health organisations, families, and breastfeeding promoters may encourage medical professionals (and their training programmes) to reconceptualise the extent to which the decision for a caesarean section is informed. Debate surrounding maternal autonomy may be misplaced – family health may be improved by focus on the accessibility of alternative birth experiences.

The next chapter presents maternal experiences of early infant interaction to ascertain what, if any, factors associated with caesarean section delivery impacted breastfeeding realisation. The results suggest interrelated biological, psychological and practical obstacles that compound each other.

Chapter 6: Maternal experiences of early breastfeeding following a caesarean section

This chapter contains maternal descriptions of breastfeeding on the postnatal ward after caesarean section delivery, the obstacles mothers reported as influencing breastfeeding and early formula supplementation.

Breastfeeding initiation

Table 6.1 shows that most participants reported[1] that their initial breastfeeding effort occurred in the recovery room.

Table 6.1: Maternal reports of the timing of first breastfeed or attempted breastfeed by type of caesarean section delivery undergone.

Participants	Ph. 1 unscheduled *n* = 27
	Ph. 1 scheduled *n* = 15
	Ph. 2 scheduled *n* = 38
	n, %
When mothers first breastfed or attempted to breastfeed:	
- Operating theatre	2, 7.4
	None
	None
- Recovery room	13, 48.1
	8, 53.3
	33, 86.8
- Postnatal ward, Day 0	10, 37
	4, 26.7
	4, 10.5
- Postnatal ward, Days 1 +	1, 3.7
	2, 13.3
	None
- No attempts	1, 3.7
	1, 6.7
	1, 2.6

Initiation within the first few hours following delivery (operating theatre or recovery room) did not vary between participants who underwent unscheduled or scheduled caesarean

[1] During the postnatal ward interview, I asked participants to recall approximately how soon after delivery they either breastfed or first attempted to breastfeed (Appendix A, p. 230, and Appendix C, p. 243). Most women estimated a range of time for their first feed, such as 'after a few hours.' I decided that it was most appropriate to categorise responses by combining participants' time estimates with where they said that they were during their breastfeeding initiation (operating theatre, recovery room, postnatal ward). Based on my observations of a caesarean section delivery and participants' accounts of their experience obtained through the interviews, women generally spent up to 45 minutes in the operating theatre for the delivery and then suturing. This was followed by about 2 hours in a recovery room on the delivery ward before the mothers and their infants were transferred to the postnatal ward.

section delivery.[1] The timing was not associated with mothers' reported reasons for breastfeeding intent.[2]

Mothers who switched to formula prior to any breastfeeding attempts discussed a low level of breastfeeding commitment combined with maternal tiredness:

> "I was just so tired and the baby hungry straight away."
>
> Ph. 1 Part. 35, first time mother. She had intended to breastfeed "for the benefits for the baby." Her delivery was an unscheduled caesarean section for indications of foetal distress during induced labour at 42 weeks gestation.

Conditions of an unscheduled caesarean section

General anaesthesia was particularly disruptive to initial mother-infant interactions. These mothers could not recall when they first saw their infants:

> "I don't know. I was delirious."
>
> Ph. 1 Part. 46. She had an unscheduled caesarean section with general anaesthesia for indications of foetal distress in spontaneous onset labour.

> "I don't remember. I was drugged and didn't know where I was…." Her partner then said that she had smiled, but that she didn't know what was happening.
>
> Ph. 1 Part. 13. She had an unscheduled caesarean section with general anaesthesia for non-progressive spontaneous onset labour after forceps application.

> "I woke up about 2 hours after the general anaesthesia. But I remember seeing him the next day."
>
> Ph. 1 Part. 37, first time mother. She had an unscheduled caesarean section with general anaesthesia for indications of foetal distress in spontaneous onset labour.

[1] Among Phase 1 women who had an unscheduled caesarean, 15 of 27 initiated in the operating theatre or recovery room versus 8 of 15 who had a scheduled caesarean section, $x^2 = 0.8897$ $df = 1$ p = 0.3456.

[2] Breastfeeding initiation within the first few hours following delivery (operating theatre or recovery room) was not associated with participants who cited infant-only reasons or infant and maternal reasons: Phase 1: 14 of 23 versus 9/20 $x^2 = 0.2980$ $df = 1$ p = 0.5851; Phase 2: 13 of 16 versus 20 of 22, p = 0.6398. Breastfeeding initiation anytime on Day 0 also not different among by the breastfeeding factors: Phase 1: 19 of 23 versus 18 of 20, p = 0.6688; Phase 2: 15 of 16 versus 22 of 22, p = 0.4211. Data on the timing of breastfeeding initiation in relation to women's reported reasons for intending to breastfeed are presented in Appendix G on page 267.

Maternal descriptions of breastfeeding frequency

In response to "how often have you been [breast]feeding, including night-time," Phase 1 women recounted their sessions in their own words. The participant descriptions fit categories of infrequent, variable or frequent breastfeeding:

> "In recovery, I tried about 3 times. Then did twice or so today…can't do it."
>
> Ph. 1 Part. 23. She had a scheduled 'repeat' caesarean section delivery. I coded her breastfeeding as infrequent.

> "Only fed twice on the first day…probably helped me actually. On the second day, I fed 4 or 5 times. Today they [twin newborns] have never been off…it's like don't leave me mommy. They want the milk to come in."
>
> Ph. 1 Part. 33. She had an unscheduled caesarean section delivery for non-progressive induced labour without indications of foetal distress. She intended to breastfeed because she "fed previous children like this. I found it really rewarding and cost effective as well." I coded breastfeeding as variable, taking into account Days 0-2.

> "Very [frequently]. I can't count it."
>
> Ph. 1 Part. 5, first time mother. She intended to breastfeed because "it's natural." I coded her breastfeeding as frequent.

Overall, few participants (17%) reported[1] breastfeeding infrequently.

Table 6.2 shows that infrequent breastfeeding was associated with participants who provided 'infant-only' reasons for breastfeeding intent compared to the women who also cited self-advantages, $p = 0.0092$ (Fisher's Exact test).

Table 6.2: Maternal reports of frequency of breastfeeds or attempted breastfeeds by reported reason for breastfeeding intent.

Participants	Ph. 1 infant-only reasons $n = 22$
	Ph. 1 included mother reasons $n = 20$
	n, %
Breastfeeding descriptions:	
- Infrequent*	7, 31.8
	None
- Variable	8, 36.4
	10, 50
- Frequent	7, 31.8
	10, 50

The asterisk represents the measure that had statistical association at the $p \leq 0.05$ level.

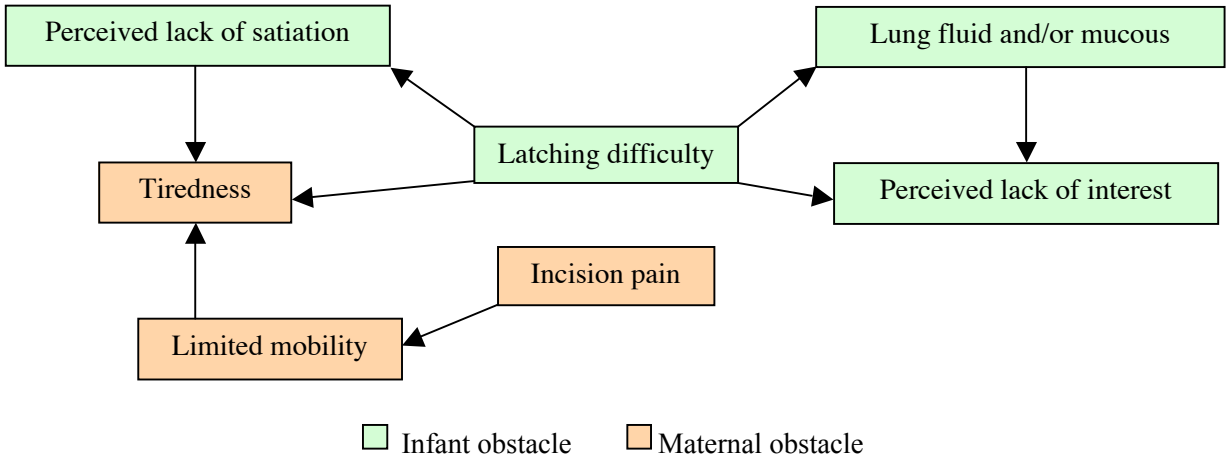
[1] Frequency data are of Phase 1 mothers who had healthy infants and initiated breastfeeding. Participant description of breastfeeding from birth to the time of the postnatal ward interview was infrequent, compared to others, in 7 of 42 Phase 1 (16.7%) cases. There was not a significant difference in the reported frequency of breastfeeding by whether participants underwent an unscheduled or scheduled caesarean section (see Appendix G, p. 268). The timing of when I interviewed mothers on how often they were breastfeeding was similarly distributed by their reported frequency, as illustrated in Appendix G on page 268.

Maternal descriptions of breastfeeding obstacles

The majority of participants (72% in both phases) reported at least one hindrance with postnatal ward breastfeeding.[1] Maternal obstacles were discussed by about half of the participants and slightly more reported at least one infant problem.[2]

The themes of the spontaneously offered breastfeeding obstacles are presented in Figure 6.1.

Figure 6.1: Maternally reported postnatal ward breastfeeding difficulties.



The nature of the obstacles did not significantly differ by the type of caesarean section delivery undergone or, in Phase 2, the postnatal ward cot type randomly allocated.[3]

Participant discussions of breastfeeding difficulty highlighted how obstacles were intertwined:

> "The first night she [the newborn] was mucousy. She is having to bring all of that up first, so isn't interested in feeding. She had to vomit up the mucous. I have to persevere even though I'm tired and want to sleep. At first, [breastfeeding was] awkward and clumsy. She [the baby] is getting the hang of it now…we're working together more."
>
> Ph. 1 Part. 26, first time mother. She had an unscheduled caesarean section delivery for non-progressive spontaneous onset labour without indications of foetal distress.

> "I was told because of not going into labour my milk didn't start. If I hadn't heard that I just would've thought it would be automatic. Because of that thought I'm probably not going to be able to [breastfeed]. I don't want to try anymore….feel stressed and the baby has mucous. I'm disappointed that I couldn't [breastfeed]."
>
> Ph.2. Part. 25, first time mother. She had a scheduled caesarean section delivery due to having a neurostimulator (refer to footnote 1, p. 91).

[1] In response to "how is the feeding going," "is there anything that is affecting the way you're feeding" and "do you think there is anything affecting your baby's ability or desire to feed," a difficulty was reported by 33 of 46 Phase 1 (71.7%) and 28 of 39 Phase 2 (71.8%) women.

[2] Maternal obstacle/s were mentioned by 20 of 46 Phase 1 (43.5%) and 22 of 39 Phase 2 (56.4%) participants. Infant obstacle/s were mentioned by 25 of 46 Phase 1 (54.3%) and 23 of 39 Phase 2 (59%) participants.

[3] Breastfeeding difficulty by the type of caesarean section undergone and the allocated cot type are presented in Appendix G on page 268.

Night-time

The night was specifically mentioned[1] as being more difficult for breastfeeding due to the absence of visitors to assist with infant care combined with mothers' compromised mobility:

> "I think that I had forgotten how debilitating it is [after a caesarean section] in the first 24 hours. I expected to be on my feet sooner…just remember things differently. Obviously, you're not yourself for a few weeks. You forget how long it takes to get better. Just forget it's major surgery. I will get help tonight with looking after them [twin newborns], 'cause I can't get up…felt bit let down by that [limited mobility]. Having to buzz [for midwifery assistance] is disappointing. You feel a bit helpless after caesarean. It's night when you mainly need the help. Breastfeeding is quite tiring and I have twins. You've [directed to babies] got that nasty mucous, haven't you. I had intended on breastfeeding straight away, but I felt so tired I just couldn't do it."
>
> Ph. 1 Part. 23. She had a scheduled 'repeat' caesarean section delivery. She planned to exclusively breastfeed but was supplementing with formula.

> "There's no doubt that you need to think about yourself…you need to get enough sleep."
>
> Ph. 2 Part. 12. She had a scheduled 'prophylactic' caesarean delivery and intended to breastfeed because "90% health of baby and also closeness…sort of bonding…it's psychologically nourishing."

> "Last I night had to hit the buzzer [for the midwife] to get my baby out. I felt like I was pestering them [the midwives], but that [feeling] is all from me. They're busy, but there for you."
>
> Ph. 2 Part. 22, first time mother. She had a scheduled caesarean section delivery for breech positioning and intended to breastfeed because of "baby's health." She was exclusively doing so on the postnatal ward.

Infant condition

The newborns' physical condition was spontaneously mentioned as inhibiting breastfeeding.[2] Mothers recounted that the midwives informed them only after delivery that newborns' regurgitating 'mucous' or lung fluid was normal after caesarean section:

> "Her [the newborn's] tummy feels full so she vomits a lot. Babies born by caesarean have mucous in them…she's gradually expelling that. They told me last night that this was what was happening."
>
> Ph. 2 Part. 42, first time mother. She had a scheduled caesarean section delivery for breech positioning.

> "The first night she was mucousy…having to bring all of that up first. So she's not interested in feeding…has to vomit up the mucous."
>
> Ph. 1 Part. 26, first time mother. She had an unscheduled caesarean section delivery for non-progressive spontaneous onset labour without indications of foetal distress.

---

[1] Night being more difficult to breastfeed was spontaneously mentioned by 7 of 46 Phase 1 (15.2%) and 17 of 39 Phase 2 (43.6%) participants. The high proportion of Phase 2 references to night-time breastfeeding difficulties may be a reflection of the research being referred to as the 'Sleep Study' (refer to p. 37) and/or the night-time filming.

[2] Mothers reported infant mucous and/or regurgitation that they attributed to inadequate foetal lung fluid clearance in 5 of 46 Phase 1 (10.9%) and 14 of 39 Phase 2 (35.9%) cases. Three of the Phase 1 cases were from mothers who underwent unscheduled caesarean section delivery.

"She's recovering from the caesarean section…is mucousy, sickly. It's not giving her opportunities [to breastfeed] as much. She's not taking any."

Ph. 2 Part. 55. She had a scheduled 'repeat' caesarean section delivery.

"They didn't tell us [prenatally] about fluid in the [baby's] lungs. It would've been a factor in whether we went for a caesarean section."

Husband of Ph. 2 Part. 72, who had a scheduled 'prophylactic' caesarean section delivery. She said that the first breastfed occurred in recovery but had since had been "very infrequent…only 3 times in 24 hours because my baby hasn't been interested."

The physiological mechanism of the infants being unwell was understood differently among the participants. It was described as occurring due to the baby:

- swallowing mucous and blood (while in the womb or when being delivered)
- getting 'something' in the lungs
- not having the 'mucous from the lungs squeezed out via labour'

Maternal pain

Post-operative pain and/or limited mobility were common features of women's discussions of breastfeeding influences.[1] These restrictions compounded what the mothers described as the inherently difficult process of early breastfeeding:

"The pain is restrictive…it's hard to breastfeed when I can't manoeuvre. I have to top up [supplement her newborn's feeds with formula] because he's very hungry."

Ph. 1 Part. 65. She had a scheduled 'repeat' caesarean section delivery and intended to breastfeed because "it's better for them."

"Breastfeeding is difficult at first. It's difficult to pick her up and hard to hold [the baby] with the incision. Breastfeeding pillows help…I found a position. I haven't had that much advice. I know that you have to ask for advice, but a few people tell us different things…not had support. I'm also not able to change her nappy because I can't pick her up…felt a bit useless."

Phase 2 Part. 40, first time mother. She who had a scheduled caesarean section delivery for breech positioning after an unsuccessful external cephalic version. She intended to breastfeed because "it's the best thing for the baby and all the benefits" and she was exclusively doing so on the postnatal ward.

"Caesarean section delivery affects your ability to [breast]feed…it's very painful and very frustrating. It's painful partly because I had a caesarean section and partly because is painful anyway…which is why I can only stand it for so long."

Ph. 2 Part. 26. She had a scheduled 'prophylactic' caesarean section delivery and intended to breastfeed because "it's better for baby…that's it basically." She was doing so exclusively on the postnatal ward.

"I'm frightened to get back into bed because I'm worried that I can't get out. The nurses couldn't get us [me] out of the bed…my partner had to."

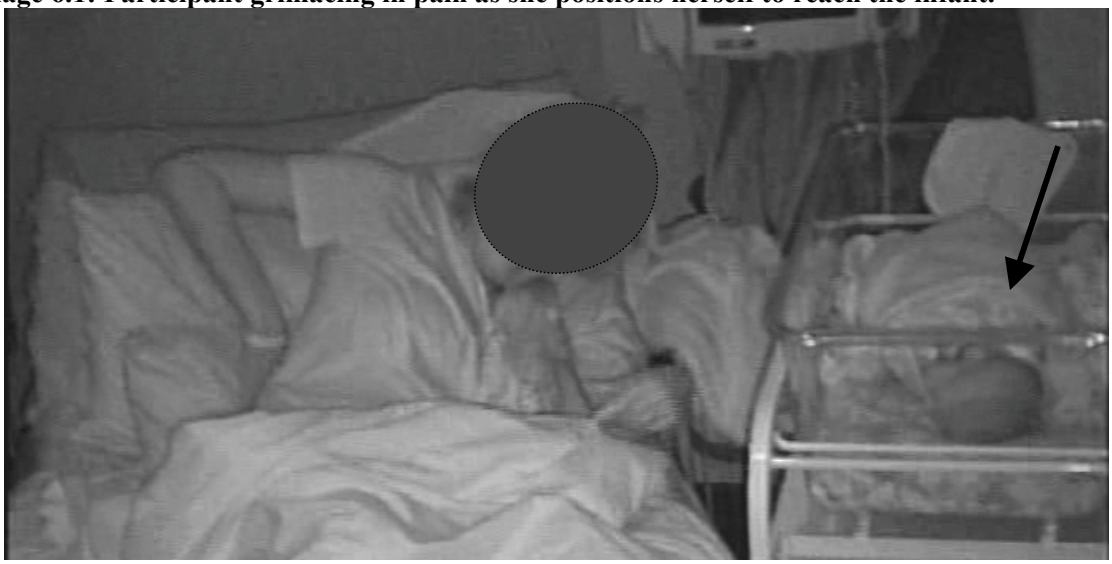
Ph. 1 Part. 13. She had an unscheduled caesarean section delivery for non-progressive spontaneous onset labour without indications of foetal distress. The medical notes listed the participant as being overweight.

[1] In relation to breastfeeding obstacles, limited maternal mobility was mentioned by 10 of 46 Phase 1 (21.7%) and 17 of 39 Phase 2 (43.6%) participants. Incision pain reportedly affected breastfeeding in 10 of 46 (21.7%) and 8 of 39 (20.5%) cases.

Mothers presented moving as incurring the most discomfort. The language was of relentless pain that caused "absolute agony." One participant said that she felt like she was going to "rip open" and that her discomfort was "not a pain you can forget...not like a headache that you can switch off."[1]

Image 6.1 illustrates the maternal post-caesarean section delivery discomfort. The arrow indicates the infant location.

Image 6.1: Participant grimacing in pain as she positions herself to reach the infant.



Breastfeeding exclusivity

The majority of participants who prenatally intended to breastfeed were exclusively doing so on the postnatal ward.[2] There was not a statistically significant difference in realising exclusive breastfeeding by type of caesarean section delivery undergone, the reported reasons for breastfeeding intent or the randomly allocated postnatal ward cot type.[3]

Unplanned formula supplementation was described as easing the maternal burden of breastfeeding:

> "[Breastfeeding is] harder than I thought…much harder than thought. Bending hurts and I think about the [caesarean section delivery incision] wound…I can't cough or sneeze. I can't pick up my baby. I feel useless but I'm still sticking with it for now."
>
> Ph. 1 Part. 52, first time mother who had an unscheduled caesarean section delivery for indications of foetal distress during induced labour. She said that she intended to breastfeed because "breast is best…best thing for baby."

[1] All of the participants received painkillers from their midwives. They did not have access to patient-controlled analgesia.

[2] According postnatal ward interviews and medical records of the health-mother-infant dyads, 31 of 46 Phase 1 (67.3%) and 32 of 40 Phase 2 (%) were exclusively breastfeeding on the postnatal ward. In Phase 1, 43 of the healthy dyads had reported exclusive breastfeeding intent, so the proportion who deviated was 12/43 (27.9%).

[3] Among the Phase 1 mother-infant dyads who did not receive intensive care and described intent to initially breastfeed without formula supplements, exclusive breastfeeding on the postnatal ward was realised by: 20 of the 29 who had an unscheduled caesarean section compared to 11 of the 14 who had a scheduled caesarean section, p = 0.7199 (Fisher's Exact test); 20 of the 22 who provided maternal advantages for their (exclusive) breastfeeding intent compared to 11 of the 21 who said infant-only benefits, $x^2 = 0.0011$ $df = 1$ p = 0.9732.

Among the Phase 2 mother-infant dyads who were healthy postpartum after a scheduled caesarean section and described intent to initially breastfeed without formula supplements, exclusive breastfeeding on the postnatal ward was realised by: 15 of 23 who provided maternal advantages for their (exclusive) breastfeeding intent compared to 10 of 16 who said infant-only benefits, $x^2 = 0.8619$ $df = 1$ p = 0.3532; 18 of 28 allocated the side-car crib compared to 14 of 19 allocated the standalone cot, $x^2 = 0.4976$ $df = 1$ p = 0.4806.

> "I'm calm this time because of my past experience [with infant feeding]. I know that [supplementing breastfeeding with formula] worked last time and I rather do that than have her crying all night."
>
> Ph. 1 Part. 22. She had an unscheduled caesarean section delivery for non-progressive induced labour without indications of foetal distress. She said she intended to breastfeed "because it is best for the child."

Maternal realisation of prenatal exclusive breastfeeding intent was also not associated with the primary infant sleep location observed in the overnight video recordings (side-car crib, standalone cot or bedsharing).[1]

Midwifery advice

Data on midwifery advice were not systematically collected because it was not a predetermined research objective. However, during the observation periods I saw a few compelling situations that undermined breastfeeding exclusivity.[2]

The first area of suboptimal midwifery support was recommendation to supplement infants with formula in an attempt to extend the feeding interval. A midwife appeared to try to turn off the video recording and then she recommended that the participant give her newborn formula. The midwife said that she was concerned about the mother getting enough sleep, that the baby would sleep for longer period if she received formula and that there should be limited nipple confusion.

Another participant was in a similar situation in which she told the midwife that she was tempted to give up breastfeeding because the baby had been awake for the past hour in the night and was 'not settling' after breastfeeding. The midwife encouraged additional breastfeeding but referred to the baby as a "menace" to the mother. A midwife of another participant similarly referred to her infant as "greedy" in response to the mother's lament over night-time breastfeeding.[3]

A second theme of postnatal ward staff actions detrimental to breastfeeding was a delay in support to mothers. During a participant's observation period, a health assistant (technician) asked how the mother was doing as she took her blood pressure. The mother mentioned breastfeeding difficulty and the technician did not respond or seek midwifery assistance. The upset woman was left on her own. The participant later buzzed for a midwife and asked to be brought a bottle of formula, to which the midwife offered breastfeeding support. However, the woman gave her infant the formula. In another example, maternal discomfort and tiredness was exacerbated by a delay in painkiller provision by the midwives. During the observation period, a participant asked a midwife for painkillers and although the midwife said she would oblige, she did not return for fifty minutes. By then, the woman was sleeping and was woken up by the midwife.

A final aspect of midwifery interactions with the mothers regarded a participant's desire to be discharged but she was having breastfeeding difficulty. During the postnatal ward interview, the woman recounted her guilt at giving her infant formula. She said that she was in a high level of pain, had very little sleep and was desperate to rest at her home. She said that the midwives said that she could be discharged if she formula fed. The mother did

---

[1] Exclusive breastfeeding was realised among participants who primarily used: side-car crib, 10 of 13; standalone cot, 7 of 11; and maternal bed 10 of 10. The p-value between the standalone cot and bedsharing sub-samples is 0.0902 (Fisher's Exact test).

[2] I have forgone providing extended quotes or participant code numbers to protect the anonymity of the midwives.

[3] In contrast, a midwife replied to a participant's confiding "I'm just so tired" as she was breastfeeding during the night. The midwife replied that "it's amazing how you can survive on such little sleep….it's 'cause you have to, isn't it." The midwife offered light-hearted comments to empathise with the mother.

switch to formula and went home the morning of Day 2. At two weeks postpartum, she reflected that "it was hard to give up on breastfeeding…but I know it was right decision for me as well."

Midwifery advice on formula supplementation was observed as portraying deviation from breastfeeding exclusivity as a common experience to breastfeeding mothers on the postnatal ward. One participant had a telephone conversation with her partner during the observation period during which she directed him to sterilise bottles at home. She explained:

> "The midwife said that every single breastfed baby has had formula tonight, so we're in the same boat. [The baby] did have formula and fell asleep straight after because she was very happy. She had fed all night just on that watery stuff [colostrum or transitional milk][1] but now is happy and sleeping like she should be. I was desperate."

[1] Colostrum is a thicker fluid to the other stages in the continuum of human milk and generally is present for the first few days postpartum (Lawrence and Lawrence, 2005).

Results summary

Breastfeeding was most often initiated in the recovery room, between approximately forty-five minutes and two hours after the caesarean section delivery. The timing was not associated with undergoing unscheduled/scheduled caesarean or with the reported reasons for breastfeeding intent. The few participants who switched to formula without attempting to breastfeed described a low level of commitment combined with maternal tiredness.

Breastfeeding on the postnatal ward was hindered by the intertwined obstacles of maternal incision pain, limited mobility and tiredness in conjunction with latching difficulty, perceived lack of infant satiation or interest and lung fluid and/or mucous clearance. The reported commonness and impact of the postnatal expulsion infant fluids was an unexpected finding. Many participants discussed their newborns being "sickly" as they recovered from the caesarean section and so they were perceived as uninterested in feeding until done "vomiting up the mucous." A few mothers stated that had they known about this possibility prenatally, it would have deterred them from the decision to undergo a caesarean section.

Limited maternal mobility was a predictable breastfeeding hindrance, but the descriptions provide insight into the "absolute agony" and fear of moving in case of "ripping open" or not being able to get out of bed. Night-time was specifically mentioned as the most difficult time for breastfeeding mothers due to the lack of visitors, hesitation to summon midwives and compounded maternal tiredness.

Maternal description of infrequent early postnatal breastfeeding was significantly associated those who had reported infant-only reasons for breastfeeding intent. Most mothers were concerned about establishing breastfeeding and some felt "useless," but the lack of frequent breastfeeding was presented as beneficial by some because it enabled the women to obtain more sleep.

Explanation for formula supplementation included satiating infants so that they would sleep, reducing the mother's need to move and minimising night-time infant crying. Some midwives recommended formula supplementation to extend the feeding session of infants who, in their words to the participants, were being a "menace." Breastfeeding may also be undermined by midwifery advertisement of the commonness of formula supplementation on the postnatal ward and/or delayed response to requests for breastfeeding support/ painkiller provision.

Neither maternal accounts of early breastfeeding nor exclusivity varied by whether women underwent unscheduled or scheduled caesarean section delivery.

Discussion

The timing of breastfeeding initiation

The majority of breastfeeding initiation occurred in the recovery room, between approximately one and three hours postpartum. My finding that the timing of breastfeeding initiation did not differ by the type of caesarean section delivery undergone is consistent with data collected by Rowe-Murray and Fisher (2002).

Breastfeeding attempts in the operating theatre were rare. This is not in accordance with Step 4 of the Baby Friendly Hospital Initiative (BFHI), which is that all mothers be supported in initiating breastfeeding within a half hour of birth (WHO, 2009b). The BFHI protocol further advises that women who undergo caesarean section with general anaesthesia have skin-to-skin mother-infant contact and be supported in breastfeeding as

soon as the dyads are "responsive and alert" (p. 34). The guidelines specifically state that this timing of breastfeeding initiation should be routine, with staff expected to document justifiable medical conditions when it does not occur. The study location was not BFHI accredited[1] – and a few participants did not initiate breastfeeding until the day after delivery.

The timing of first breastfeeding among my participants was later than most hospital births in the UK during 2005 (Bolling et al., 2007).[2] In the NHS hospitals, newborns were reported as having been put to the breast within an hour in 71% of cases compared to the estimated 4.7% of Phase 1 women and 0% of Phase 2. In my study, the data may have differed from the national statistics due to my relatively small sample size and/or the different research methods. I interviewed women on the postnatal ward and the participants in Bolling and colleagues' study completed postal questionnaires when the infants were between four and ten weeks old. My participants offered two descriptions of their breastfeeding timing, by reporting the length of time after delivery they first breastfed and the point in their trajectory of operating theatre – recovery room – postnatal ward location, so significant discrepancy between the data and what actually happened is unlikely.

The extent to which the timing of breastfeeding initiation was delayed among my participants due to caesarean section delivery is limited by absence of comparison with women who birthed vaginally. Other research, however, suggests there is a difference by birth mode. Evans and colleagues (2003) found that after caesarean section (n = 52 unscheduled and n = 45 scheduled), breastfeeding was initiated within an hour of delivery in 18% of cases, between 1 and 4 hours with 54.6% of women and after four hours among 26.8%. They found that this was significantly later than 88 women who had vaginal delivery at the same location, with 64.8% of them initiating within an hour postpartum, $p < 0.01$. An important component in this comparison by Evans and co-researchers is that they point out that 6 of the 52 unscheduled caesarean section deliveries were conducted with general anaesthesia. I also detailed the conditions in which unscheduled caesarean sections were conducted to identify when hospital protocol is amenable to change. Research that specifies caesarean section types and anaesthesia methods may be essential so as not to confuse what early mother-infant interactions are secondary to clinical circumstances (such as the woman being unconscious and/or the newborn receiving intensive care) in contrast to a result of hospital protocol failing to support skin-to-skin contact and breastfeeding.

Maternal perception of breastfeeding and reported early frequency

The finding by Scott and colleagues (2006) that maternal and paternal general attitudes towards breastfeeding are associated with the likelihood of any and exclusive continuation by hospital discharge, among over 500 Australians, supports my finding that the perception of infant feeding impacts its realisation. Phase 1 women who provided infant-only reasons for breastfeeding intent were significantly associated with descriptions of breastfeeding less frequently on the postnatal ward than those who spontaneously offered rationales for breastfeeding that included maternal factors. This data and that of Scott and colleagues' suggest that a cost-infant benefit breastfeeding model would be useful for predicting outcomes.

Other research that identified maternal perseverance as being associated with breastfeeding success did not explore the meanings of what this variable meant to women. Pérez-Ríos, Ramos-Valencia and Ortiz (2008) found that among 1,701 mothers in Puerto Rico

[1] Currently, only 49 of 320 (15.3%) maternity units in the United Kingdom have full Baby Friendly accreditation (UNICEF UK BFHI, Accessed September 2009 at http://www.babyfriendly.org.uk/htables/country_view.asp).
[2] The national data for the timing of breastfeeding initiation are not stratified by birth mode.

"breastfeeding persistence" was positively associated with initiation, $p < 0.0001$. This measure was a result of a yes/no survey response to the question "in the hospital before birth, did the hospital personnel insist you breastfeed your baby" (p. 295). Their terminology is confusing, as it may reflect: women's perception of being provided prenatal information on its health impacts; midwifery discussion of postnatal ward support available to assist with breastfeeding; infant feeding posters/media campaigns in the hospital or a variety of other influences on how women could interpret this question. The ambiguous finding and limited discussion in the Puerto Rican study does not suggest that women should be told that they must breastfeed (which would be an unethical breech of maternal autonomy but could be extrapolated from their paper). Alternatively, I suggest that it indicates the need for future research into the extent to which women perceive breastfeeding as being promoted and possible.

Insight into mother's perspectives on the general factors that they consider as influencing breastfeeding success is provided by Avery and colleagues (2009). They conducted grounded theory analysis of data collected in American focus groups comprised of pregnant, breastfeeding or formula feeding women (n = 152 participants in total). The authors classified three areas for which maternal confidence emerged as vital in descriptions of breastfeeding realisation: physiological process of lactation; one's ability to learn to breastfeed; and making breastfeeding 'work' despite obstacles.

The conclusion that Avery and her co-authors colleagues draw, that breastfeeding is a learned skill among those who are successful, is obvious from an anthropological perspective. What their study highlights is the need to reinforce this concept among women and those around them, to avoid the maternal perception of 'not being able to do it.' This viewpoint was evident among some of my participants after their initial attempts and may reflect a lack of appropriate preparation regarding the experience of breastfeeding. Reference to breastfeeding as natural and evolved processes needs to be coupled with discussion of the practice and appropriate positioning required by mother-infant dyads. Dykes (2006) shares this viewpoint; she warns that women may feel as though they have failed if the 'natural' process of breastfeeding does not feel as though it is coming naturally to them. Breastfeeding is characterized as an art by La Leche League International (2004) in recognition that it requires "information, encouragement and some motherly know-how" (p. xiii).

Avery and colleagues (2009) suggest that most women expect to have a positive experience with breastfeeding and that maternal commitment was based in part by the discomfort and inconvenience they associated with it. The researchers offer the term 'confident commitment' to convey the theme of process-efficacy – the ability to negotiate the dynamics involved with breastfeeding/lactation. Avery and her co-researchers conclude that there is a need to investigate breastfeeding behaviour with reference to the above-mentioned components of maternal confidence. My data illustrate some of the maternal and infant pathways in which breastfeeding commitment was specifically challenged after a caesarean section delivery.

Compounding breastfeeding obstacles

Across hospitals in England, the most frequently cited problem with breastfeeding in the hospital was latching difficulty, breastfeeding being uncomfortable/painful and the infant not feeding properly/enough/not interested (Bolling et al., 2007). These issues were present in my study, with additional maternal attribution of caesarean section delivery for breastfeeding difficulty in relation to infant sleepiness, inadequate infant lung fluid clearance, their limited mobility and perception of an inherent delay in the onset of lactogenesis II. When Churchill, Savage and Francome (2006) asked women if they felt

that the "caesarean has had an effect on your ability to breastfeed your baby," their results included the same themes as just mentioned except for the infant mucous. My data are the first of which I am aware that document mothers' experiences with sub-clinically poor infant condition and breastfeeding, although the lung fluid challenge is theoretically and anecdotally discussed by Odent (2004).

Research has investigated the relationship between gestational age and clinically notable infant morbidity after non-labour delivery, but the effects of less severe biological disruption is absent from discussion of caesarean section appropriateness and timing. This may be overlooked in obstetrics because the inadequate lung fluid clearance is a consequence of the delivery context itself. I did not investigate the antenatal information provided to participants, but women's statements of disappointment in learning of 'mucous' is being common after caesarean section suggests that if this risk were addressed, it was done so ineffectively.

Alternatively, explanation for the 'mucous' breastfeeding obstacle may mostly relate to midwifery practice. Infant lung fluid is clear (M. Ward-Platt, personal communication, September 2009), distinct from the mucous that lines the newborn gut (Blackburn, 2007: 503). Infant regurgitation is common but less so among those exclusively fed breast milk (Hegar et al., 2009). It is possible that some midwives suggested to mothers that the 'normal' regurgitation observed in the babies was due to the scheduled caesarean section because they lack adequate education regarding foetal, neonatal and/or childbirth physiology. The maternal accounts of infants swallowing substances *in utero* or during caesarean section delivery would be of amniotic fluid,[1] which occurs from eight to eleven weeks into the pregnancy without harm (Blackburn, 2007).

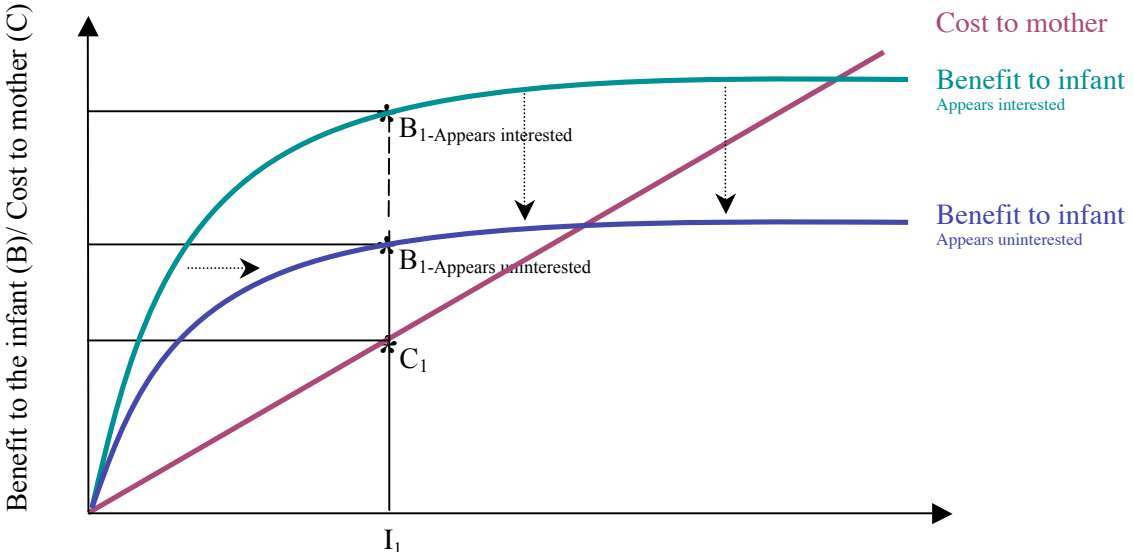
Further, midwives may have presented infants as unwell and uninterested in feeding because they were too busy to stay with the mothers to facilitate breastfeeding. This possibility was suggested to me by a midwife at the Society for Reproductive and Infant Psychology 29th Annual Conference. All three of the issues – infant lung fluid due to lack of 'expected' catecholamine surge, regurgitation of mucous that lines infant stomachs and midwifery fabrication of a clinical condition – are areas that can be explored in future research.[2]

Infant obstacles were framed by the mothers as reducing the need for frequent postnatal ward breastfeeding, not as increasing the importance. This may be due to maternal confusion of infant cues from a combination of newborns' depressed neurobehaviour and vomiting. Maternal perception of lack of infant interest in breastfeeding can be modelled as shifting the infant benefit line right, as proposed on page 81 and presented below in Graph 6.1. Maternal investment at any level along the cost line subsequently results in less perceived benefit to the infant. Additionally, there is less incentive for mothers to increase investment because marginal returns are reduced to a greater extent than if the infant appears interested in breastfeeding.

[1]Amniotic fluid is comprised of components from the placenta, foetal respiratory tract (some lung fluid) and the foetal urinary tract (Blackburn, 2007: 107; Stables, 2005: 159).

[2] Doctor Ward-Platt (refer to p. 38) suggested (personal communication, September 2009) that the effect of birth mode on newborn lung fluid could be assessed by serial magnetic resonance imaging (MRI). However, MRI use is expensive, the equipment is unlikely to be located near a hospital postnatal ward and requires the person to remain still for an extended period of time for the scan.

Graph 6.1: Theoretical mother-infant health trade-offs for breastfeeding at a certain point in time when the mother perceives an infant as uninterested in breastfeeding.



In Graph 6.1, the dotted lines highlight the difference in infant benefit, $B_{1\text{-Appears interested}} - B_{1\text{-Appears uninterested}}$, at investment level I_1.

Similarly to the 'dose-response relationship' of BFHI Steps and breastfeeding achievement found by Declercq and colleagues (2009), breastfeeding obstacles after a caesarean section delivery were interrelated and compounding. Declercq and her co-researchers found that after all birth modes, helping mothers initiate breastfeeding, staff not supplementing breastfed babies, informing mothers about breastfeeding support options and staff not providing a pacifier were associated with realising breastfeeding. These broad categories are supported by my data and I contribute the more specific areas of infant condition, maternal perception of infant interest, maternal conceptualisation of breastfeeding along with the issues addressed below of maternal tiredness and pain.

Maternal anticipation of convenience and their experience of postnatal ward tiredness dominated their views of infant feeding. Research has demonstrated, however, that formula provision does not actually alleviate maternal fatigue, as suggested by some of my participants or their midwives. Callahan, Séjourné and Denis (2006) found that French mothers (n = 253) reported similar levels of fatigue at different points (2-4 days postpartum, 6 weeks and 12 weeks) regardless of whether they initiated breast or formula feeding. What I suggest formula feeding may do is increase the maternal perception that they are doing everything they can do minimise the cost to themselves. Future research could test whether antenatal discussion of the lack of 'relief' in postpartum tiredness from formula feeding (if regulations regarding no night-time visitors are maintained) has an effect on early breastfeeding frequency and/or exclusivity after a caesarean section.

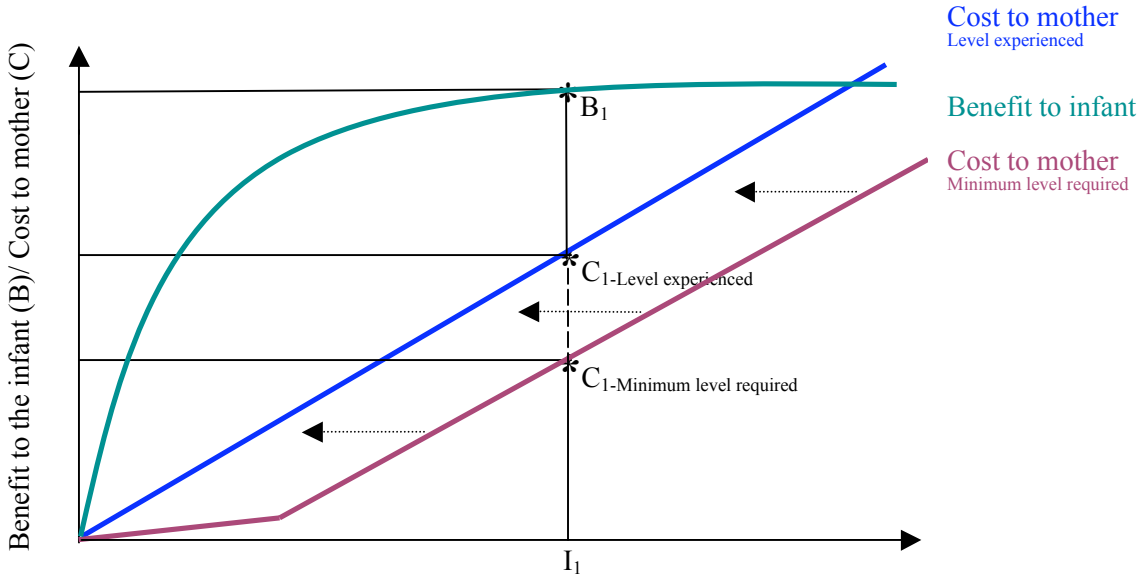
As cautioned by Lawrence and Lawrence (2005), post-caesarean section women are surgical patients. My participants discussed the importance of mental preparation for the caesarean procedure 'to sink in.' Women who had the "luxury of time" could ready themselves for the delivery, but some were surprised at the level of postpartum discomfort – that they had not anticipated or forgotten.

Previous research has found most women who underwent caesarean section delivery reported experiencing pain from their surgery over the first two months postpartum, with

33% describing it as a major issue and 18% had chronic caesarean section pain for at least 6 months (Declercq et al., 2008). As in my research, Declercq and her co-investigators did not find a difference in the reports of pain by the type of caesarean section undergone. The authors conclude that to make an informed choice about delivery method, women need to have realistic expectations about labour and postpartum pain. I would add that the discomfort should be presented in relation to how it may impact the mother-infant dyad as a whole, so that women can prepare themselves for the postnatal experience as well as the delivery.

In my study, maternal frustration was prevalent from limited mobility, tiredness and discomfort. This is consistent with the findings of Rowe-Murray and Fisher (2001), as reviewed on page 20. The participants felt 'a bit down' about needing to request assistance from the 'busy' midwives because they wanted to care for their infants themselves. Previous research has shown that mothers prefer when midwives offer assistance instead of requiring the women to seek it (Lavender et al., 2005; Graffy and Taylor, 2005). Graph 6.2 shows that the obstacles to breastfeeding can be modelled as shifting maternal cost to the left from a minimum level that would be required under more ideal conditions.[1] This has the same effect as in Graph 6.1, which is a decrease in the benefit/cost ratio and less of a marginal return for an increase in breastfeeding investment.

Graph 6.2: Theoretical mother-infant health trade-offs with breastfeeding at a certain point in time when obstacles increase the perception and/or actual effort required.



In Graph 6.2, the dotted line highlights the difference in maternal cost, $C_{1\text{-Level experienced}} - C_{1\text{-Minmum level required}}$, at investment level I_1.

Although midwives should not encourage formula supplementation, mothers who feel that they are not capable of early breastfeeding should be reassured that they can initially rest and then initiate hours later or even the day after delivery. There is a 'window of opportunity' in which nipple stimulation needs to be initiated for physiological regulation of lactation in addition to maternal confidence (refer to p. 27), but the provision of a few bottle-feeds does not rule out the possibility for later breastfeeding. Emotionally sensitive

[1] Refer to page 15 for reference to a minimum level of maternal time and effort required for breastfeeding that is sufficient to sustain offspring as discussed in relation to human life history by Reiches and colleagues (2009).

but physiologically clear breastfeeding support, including reiteration of the long-term maternal benefits of lactation, may help mothers overcome initial difficulty with the energy to breastfeed. If the mother needs an extended period of rest, midwives or family members could assist her in using a breast pump to maintain high levels of prolactin and provide colostrum to the newborn.

Deviation from intended exclusive breastfeeding

Consistent with the maternal discussion of conflicting influences on their breastfeeding intent (refer to Chapter 4), supplementation on the postnatal ward was explained as providing healthy breast milk while minimising the time, frustration and/or pain involved with breastfeeding. Formula provision on the ward was advertised by a midwife and was reassuring to a participant, but this is cause for concern as it may connote medical approval of the supplementation. Deviation from intended breastfeeding exclusivity did not seem to cause concern among most mothers – possibly due to them feeling it was necessary in their circumstances – but was very upsetting to some. Providing information on the health impact of breastfeeding (refer to pp. 1-3) needs to be balanced by adequate support to enable women and their infants to achieve the relationship.

Based on her research of British women's experiences of breastfeeding in the hospital, Dykes (2006) concludes that the current system of postnatal care renders many families and caregivers unsatisfied. The frustration and guilt that she found among mothers when the 'demands' of breastfeeding seemed unachievable were echoed by some of my participants, through their struggle to breastfeed during the night and with great effort in manoeurving themselves. Dykes argues that breastfeeding is largely discussed positioned in public health in a manner that compartmentalises the infant and the breast instead of revolving around the relational and physiological connectedness between the mother and child. She describes a rise in the medical perspective that not all mothers can manage exclusive breastfeeding with an institutionalised failure to meet women's needs on the postnatal ward.

Supplementation of breastfeeding is common in the UK – it was reported by 28% of breastfeeding mothers whose babies did not receive intensive care in 2005 (Bolling et al., 2007). The 'need' to supplement while in the hospital that was described by 12% of breastfeeding mothers nationally (Bolling et al., 2007) is consistent with the proportion of my Phase 1 and 2 mothers who reported lack of infant satiation (10.9% and 17.9%) and maternal tiredness (19.6% and 23.1%) as hindering breastfeeding. My data on deviation from breastfeeding exclusivity (and the distanced nature of maternal description of infant benefit from breastfeeding presented in Chapter 4) support the suggestion by Dykes (2006) that exclusive breastfeeding is largely viewed as ideal but its achievement is uncertain because of the clarity of the amount of formula provided to the infant and its perceived superiority with satiation. If new mothers were aware that many of their peers have similar concerns as to whether their colostrum/ breast milk is adequate and if their infant is behaving 'normally,' then individual perception of the need to provide formula may be diminished.

Declercq and her co-authors (2009) suggest that the large gap between the proportion of women who intend to breastfeed and those who actually achieve it is an area for "teachable moments" to increase women's commitment (p. 934). I was surprised that their conclusion focused on the need to increase the proportion of mothers who intend to exclusively breastfeed. They reported 86% of primiparas and 78% of multiparas in their sample (n = 1,573) as having intended to do at least some breastfeeding, with 70% and 57% planning it exclusive of formula. A goal of the United States Healthy People 2010 is for 75% of mothers to breastfeed in the early postpartum period (US Dept. of Health and Human

Services, 2000). While these rates of breastfeeding intent do merit research, it seems that the overwhelming need for intervention is better identifying and supporting women's realisation of planned infant feeding. An intervention could be to change reference to breastfeeding from 'on demand'[1] to 'as the *infant needs*.' Replacement of the word 'demand' may eliminate conceptualisation of infant manipulation and the language of 'need' permits a broader perspective of infant capabilities and also of lactation physiology. This could be implemented by alteration of BFHI Step 8 from "encourage breastfeeding on demand." Additionally, the more accurate framing of breastfeeding can be incorporated into BFHI Steps:

1. have a written breastfeeding policy that is routinely communicated to all health care staff
2. train all health care staff in skills necessary to implement this policy
3. inform all pregnant women about the benefits and management of breastfeeding

and the following Coalition for Improving Maternity Services (CIMS) Steps:

2. provide culturally competent care
8. encourage all mothers and families to touch, hold, breastfeed and care for their babies

If people were doubtful about whether an infant would *need* feeding more frequently than every four hours or some predetermined timeframe, then the terminology permits explanation of infant anatomy (small stomachs) and the composition of breast milk (low-solute). The simple but clear physiological explanation may be helpful in preventing mischaracterisation of infant cues as personality traits.

While Declercq and colleagues (2009) recommend that greater interest in exclusive breastfeeding should be stimulated among all mothers, they point especially to those who have experienced adverse postnatal circumstances. Chapter 5 results contributed to knowledge about how women arrive in the context of breastfeeding after a caesarean section delivery for the purpose of limiting this need. My data also demonstrate that breastfeeding experience is associated with maternal intent for infant feeding (refer to Chapter 4). Further, infant feeding researchers may more accurately document breastfeeding influences by anticipating interrelated obstacles instead of using responses from closed questions to only hypothesise why mothers 'gave up' (see Wright, Parkinson, and Scott, 2006). The use of language such as 'giving up' conveys judgment about the extent to which outcomes are individually determined, which may detract from reality because I found various environmental obstacles.

The focus of study undertaken by Declercq and her co-authors (2009) was to question why such a substantial proportion of women with breastfeeding intent supplement or discontinue providing breast milk. In addition to the maternal perception of infant benefit, self-advantages and her physical environment (which is further addressed in Chapter 7), midwifery advice emerged as a concern in my study. This is consistent with the findings of Reddin, Pincombe and Darbyshire (2007) that new midwives report that there is "a huge clash" between what is meant to happen in the hospital and what actually does in terms of support for mothers (p. 75).

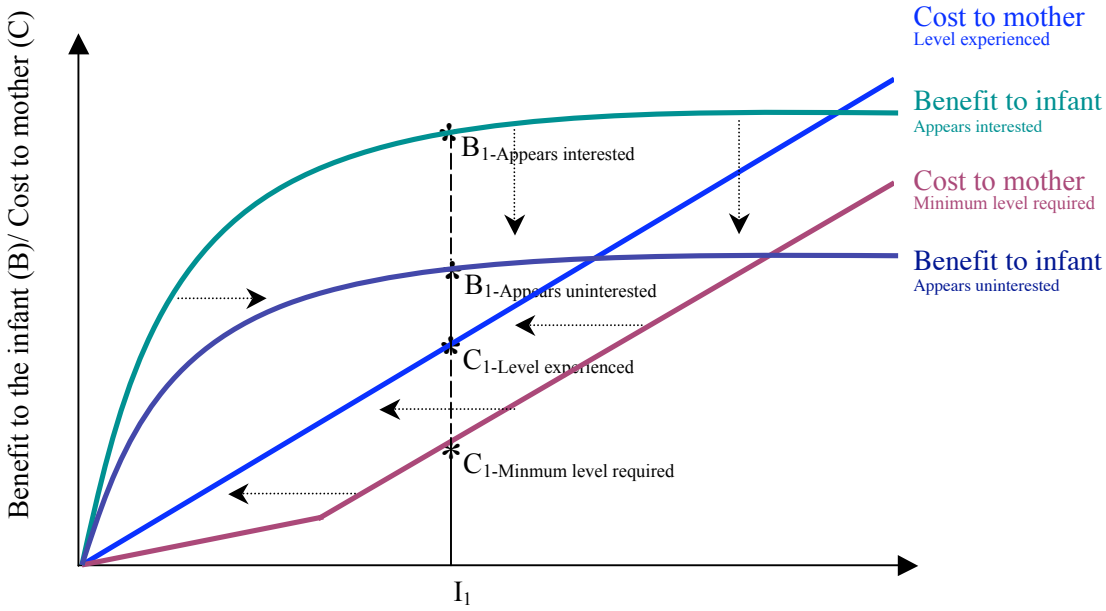
My data suggest that inadequate midwifery explanation of lactation physiology and limited emotional support undermined some women's breastfeeding efforts. Maternal perception of infants as uninterested in feeding may have been heightened by midwifery

[1] The history of infant feeding practices, including the rise of scheduled feedings and the subsequent defense of 'demand' breastfeeding, is detailed by Fildes (1986). The biological implications of culturally constructed breastfeeding patterns are discussed by Woolridge (1995). I would apply the same argument against reference to 'baby-controlled' breastfeeding.

characterisation of the newborns as "lazy" or not wanting to breastfeed. In England, breastfeeding mothers were more likely to change to exclusively formula feeding within two weeks if they reported having lacked help or advice with their feeding problems compared with of mothers who did say that received support (Bolling et al., 2007). Spatz and Pugh (2007) argue for better midwifery/nurse standards since they are the primary support for breastfeeding families while in the hospital.

A cost-benefit model of breastfeeding trade-offs is applicable to midwives' perspectives as well as mothers' viewpoints. Graph 6.3 shows how the various infant and maternal circumstances on the postnatal ward after a caesarean section delivery may impact breastfeeding advice. The model illustrates that at a certain level of maternal investment in her infant (which can be measured by breastfeeding frequency or other proxies), the interaction between the benefit to the infant and cost to the mother predicts the value placed on the breastfeeding behaviour. This is a useful tool because it shows how intervention in one or more of the obstacles to breastfeeding may impact midwifery support of breastfeeding.

Graph 6.3: Mother-infant health trade-offs with breastfeeding at a certain point in time when one perceives and/or experiences infant benefit as reduced and maternal costs as heightened compared to other circumstances.



In Graph 6.3, the dotted lines highlight the difference in infant benefit, $B_{1\text{-Appears interested}} - B_{1\text{-Appears uninterested}}$, and maternal cost, $C_{1\text{-Level experienced}} - C_{1\text{-Minmum level required}}$, at investment level I_1.

The principal tenet in medicine is to do no harm. Supplementation advice for the mothers to get through the night when they are tired, in pain, separated from their partners/family/friends and upset after a caesarean section is understandable but it actually harms the dyads' longer-term health. Midwifery suggestion to provide formula to breastfed infants may increase the maternal cost of breastfeeding investment - through the social pressure and perception of the difference between formula and breast milk as not medically 'mattering.' A problem could be with midwifery education, which may operate within the interventionist framework I illustrated in Figure 5.4 (p. 109). Smale and colleagues (2006) describe the training of maternity caregivers as inadequate and fragmented. Differing levels of midwifery knowledge of breastfeeding and support strategies are not surprising, as

Cantrill, Creedy and Cooke (2003) report that midwives (n = 1,105) said that their most common source of breastfeeding information was on-the job. These researchers also found that only 3% of the surveyed respondents rated their midwifery education programme or the hospital as a valuable source for infant feeding information. Lack of standardised education is hugely important, as midwifery attitudes and care were the most common theme in descriptions of both helpful and unhelpful maternal experiences in a study by Yelland, Krastev and Brown (2009). The World Health Organization has recently issued a model chapter regarding infant feeding for midwives and other health professionals (2009c).

When training is to WHO standards, the culture of the hospital may lead new entry midwives to deviate from their intended support practices. Reddin, Pincombe and Darbyshire (2007) conducted semi-structured interviews with Australian midwives who had recently graduated (n = 17) and found that time pressure and entrenched practices of senior midwives who were "out of touch with evidence based practice" undermined adherence to BFHI guidelines (p. 75). The authors addressed how task-orientation instead of breastfeeding prioritisation and low levels of staffing impacted each of the Ten Steps. The quotes provided by Reddin, Pincombe and Darbyshire support my findings that some midwives recommend formula to extend the infant feeding interval so "then everybody will be happy" (p. 75). If the physiological consequences of breast milk compared to formula were presented with the evolutionary medicine perspective of infant sleep and feeding as normal for the human species, then their balance between alleviating maternal tiredness and promoting breastfeeding may shift.

The data presented in this chapter indicate that a more holistic presentation of the experience of caesarean section delivery is required for ethical consent/refusal. Many women were upset about being informed postnatally that (sub-clinical) poor infant condition was common after a scheduled caesarean section. The physiological mechanisms were unclear to individuals and across the sample, indicating a need for consistent prenatal and postnatal explanation of non-labour delivery. Conditions that have been considered sub-clinical are increasingly identified as impacting child health (see Aryeetry et al., 2008; Wayse et al., 2004). Churchill, Savage and Francome (2006) asked obstetricians to list the risks of caesarean section delivery that they routinely mention to women. Breastfeeding difficulty was not mentioned by any of the 100 doctors in their sample. The UK National Institute for Clinical Health and Excellence guidance (2004) also does not include the possible impact on breastfeeding in the risk factors for caesarean section delivery, despite suggesting in the main text of the policy document that women who have a caesarean section "should be offered additional support to help them to start breastfeeding" (p. 19).

The delay in first breastfeeding and mothers accounts of relatively infrequent feedings can provide insight into why delayed onset of lactogenesis II (Dewey et al., 2003) and lower likelihood of regaining infant birth weight by the end of the first postpartum week (Evans et al., 2003) is associated with caesarean section delivery (refer to Chapter 2). Clearer physiological explanation regarding the interconnectedness of birth and breastfeeding and the relationship between early breastfeeding frequency and the onset of full breast milk production can be offered as prenatal education and postnatal advice. Miracle and Fredland (2007) commentate that with the scientific evidence of the health impacts of breastfeeding/lactation, all health care providers working with expectant women or mothers are ethically obliged to provide respectful and evidence-based support.

Nommsen-Rivers and Dewey (2009) discuss that despite the existence of various theories of health behaviour[1] that have been applied to breastfeeding realisation, there is a need for a quantifiable method for predicting outcomes. These researchers developed the Infant Feeding Intentions Scale, to prenatally measure women's plans for breastfeeding duration and the strength of their commitment. The five questions[2] that are answered on a Likert-scale were validated by Nommsen-Rivers and Dewey as different between pre-hospital admission feeding choice groups, $p < 0.0001$, associated with mother's planned exclusive breastfeeding duration, $p < 0.0001$ and predictive of actual duration of exclusive breastfeeding, $p < 0.0001$. Application of a cost-benefit approach to breastfeeding investment may be a useful supplement to the Infant Feeding Intentions Scale. My framework models the weight women attribute to certain influences underlying their intentions.

Summary

This chapter demonstrated that both infant and maternal derived hindrances to breastfeeding are reported as important among mothers after a caesarean section. There were no significant differences in the issues by whether women underwent unscheduled or scheduled caesarean section delivery. The physiological functioning of the infant, maternal mobility and midwifery advice dominated women's descriptions of "how the feeding was going." The data suggest that maternal commitment to breastfeeding, measured by whether the women perceived the feeding method and/or the process of lactation as conveying benefits to themselves, impacted their postnatal ward effort.

The next section details the results of the breastfeeding intervention among the Phase 2 participants. The frequency of breastfeeding sessions per observed hour did not significantly vary by side-car crib or standalone cot allocation, but the high proportion of bedsharing that occurred complicates this finding.

[1] A prominent model is the theory of planned behaviour, which involves different stages of thought and action regarding a health related practice (Ajzen, 1991 in Nommsen-Rivers and Dewey, 2009). This has been used specifically to investigate breastfeeding by a variety of researchers, including McMillan and colleagues (2009), Giles and colleagues (2007) and Swanson and Power (2005).

[2] The Infant Feeding Intentions scale comprises the following questions, with a 0 – 4 scale of response that is listed under corresponding terms of 'very much agree' to 'very much disagree:' 1. I am planning to only formula feed by baby (I will not breastfeed at all). 2. I am planning to at least give breastfeeding a try. 3. When my baby is 1 month old, I will be breastfeeding without using and formula or other milk. 4. When by baby is 3 months old, I will be breastfeeding without using any formula or other milk. 5. When my baby is 6 months old, I will be breastfeeding without using any formula or other milk (p. 336). The questions were also presented in a Spanish version when appropriate.

Chapter 7: The impact of the randomised intervention on breastfeeding on the postnatal ward following a scheduled caesarean section

This chapter presents the effects of the randomly allocated cot types on postnatal ward breastfeeding frequency, mother-infant proximity and the participants' sleep. The amount of time midwives were present was also measured to determine if staff workload varied with the side-car crib or standalone cot provision. Additional data document the impact of the randomised intervention on infant risk situations and maternal satisfaction.

Observed breastfeeding frequency

Intention-to-treat analyses

The data presented in Table 7.1 illustrate that the Phase 2 group of mothers who were randomly allocated the side-car crib breastfed more frequently than those who received the standalone cot.[1] However, none of the differences were associated at the $p \leq 0.05$ level.[2]

Table 7.1: Breastfeeding frequency during the observation period by the randomly allocated postnatal ward cot type.

Participants	Side-car crib $n = 20$
	Standalone cot $n = 15$
	Median (range)
Breastfeeding frequency per hour:	
- Observation	0.64 (0.12 – 1.61)
	0.40 (0.00 – 1.07)
Breastfeeding effort per hour:	
- Observation	0.73 (0.12 – 1.64)
	0.40 (0.00 – 1.11)
Nipple stimulation per hour:	
- Observation	0.72 (0.12 – 1.64)
	0.40 (0.00 – 1.11)

The observation periods included formula supplementation of breastfeeding in 7 of the 35 cases (20%). This was split evenly between the arms of the trial, with 4 of the side-car crib and 3 of the standalone cot allocated participants.

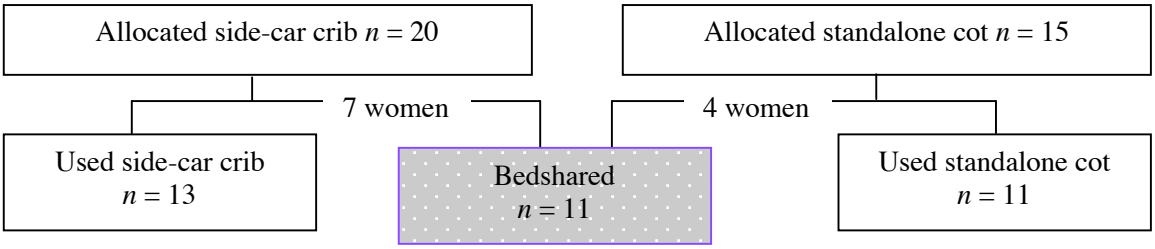
[1] Breastfeeding effort and nipple stimulation results are not independent findings from the breastfeeding sessions (or each other). Successful breastfeeding sessions were included in the other two measures.

[2] The frequency of breastfeeds did not vary between the side-car crib and the standalone cot groups, mean difference (95% CI): 0.26 (-0.01 – 0.52), p = 0.093 (Mann-Whitney U test). Breastfeeding effort per hour was not associated with the side-car crib or standalone cot groups: 0.27 (-0.01 – 0.56), p = 0.099 (Mann-Whitney U test). Nipple stimulation per hour also was not different according to whether participants were allocated the side-car crib or standalone cot: 0.26 (-0.02 – 0.54), p = 0.114 (Mann-Whitney U test).

Maternal compliance with the allocated cot type

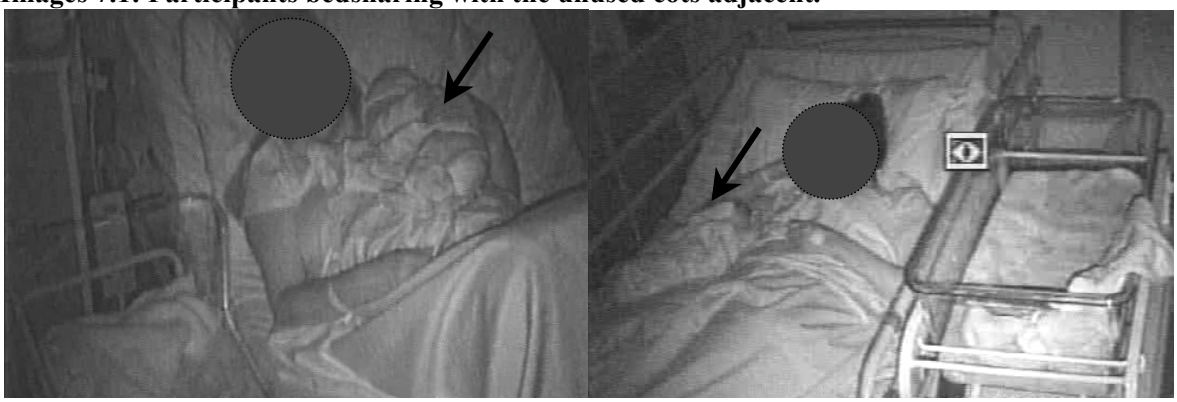
Almost a third of the filmed women spent the majority of the observation period bedsharing.[1] Figure 7.1 illustrates that compliance to the randomly allocated cot type did not significantly vary between those who were allocated the side-car crib compared to the standalone cot.[2]

Figure 7.1: Compliance with the randomly allocated postnatal ward cot type during the observation period.



The following images are examples of mother-infant bedsharing on the postnatal ward.

Images 7.1: Participants bedsharing with the unused cots adjacent.



The proportion of bedsharing ranged from none to the entirety of infant sleep. The amount of bedsharing was similar by whether the mother-infant dyads were allocated the side-car crib or standalone cot.[3]

Mothers who spontaneously bedshared for the majority of infant sleep time reported completion of more schooling than those who primarily used either cot type as the infant sleep location.[4] The other recorded participant characteristics did not significantly vary among those who used the different locations for infant sleep.

[1] I measured maternal compliance with the randomly allocated cot conditions during the observation period by two methods: 1) the infant location for $\geq$ 50% of infant sleep time and 2) the infant location for $\geq$ 50% of the time the mother was asleep. The two definitions of cot adherence led to identical results, with 11 out of the 35 bedsharing (31.4%).

[2] There were 7 of 20 who switched from the side-car crib to bedsharing (35%) versus 4 of 15 who were allocated the standalone cot (26.7%), p = 0.7210 (Fisher's Exact test).

[3] The proportion of bedsharing between side-car crib versus standalone cot group allocation by infant sleep location, mean difference (95% CI): -0.01 (-0.23 – 0.21), p = 0.790 (Mann-Whitney U test) and infant location when mother asleep: 0.06 (-0.19 – 0.32), p = 0.761 (Mann-Whitney U test). Appendix G on page 271 depicts the proportions of bedsharing over the observation period by the allocated postnatal ward cot type.

[4] All 11 women who bedshared during the observation period had at least an undergraduate degree compared to 13 of the 22 who primarily used either cot type as the infant sleep location, p = 0.0150 (Fisher's Exact test).

On-treatment analyses

Bedsharing as the primary infant sleep location was associated with significantly more frequent breastfeeding during the observation period compared to the participants who used the standalone cot or the side-car crib.[1] Breastfeeding frequency did not differ between the groups that primarily used the side-car crib or standalone cot as the infant sleep location.[2]

Image 7.2: Mother and infant asleep (bedsharing) after recently breastfeeding.

In order to explore if bedsharing had a differential effect on these on-treatment results, I analysed breastfeeding frequency by the cot groups from which the bedsharers derived. The data presented in Table 7.2 show that bedsharers from the side-car crib group breastfed more frequently per hour than the bedsharers who crossed-over from standalone cot allocation. However, the difference was not statistically significant.[3]

Table 7.2: Dilution effect of bedsharing on side-car crib breastfeeding frequency.

		Median (range)
Frequency observed per hour:		
- Breastfeeding	Side-car crib allocation and use *n* = 13	0.49 (0.12 – 1.26)
	Bedsharers from side-car crib *n* = 7	0.98 (0.75 – 1.61)
	Standalone cot allocation and use *n* = 11	0.40 (0.00 – 0.92)
	Bedsharers from standalone cot *n* = 4	0.43 (0.00 – 1.07)

Household income among the bedsharer cross-overs from the side-car crib group was high, with 4 of 7 reporting £70,000+ compared to none of the 4 bedsharers from the standalone cot reporting this highest category. All other characteristics were similar across the groups.[4]

[1] Breastfeeding frequency was greater among bedsharers compared to those who primarily used the standalone cot as the infant sleep location, mean difference (95% CI): 0.40 (0.05 – 0.75), p = 0.028 (Mann-Whitney U test). Breastfeeding effort was more frequent among bedsharers compared to those who primarily used the side-car crib as the infant sleep location: 0.29 (-0.06 – 0.64), p = 0.041 (Mann-Whitney U test). Nipple stimulation was more frequent among bedsharers compared to those who used the side-car crib: 0.29 (-0.06 – 0.64), p = 0.041 (Mann-Whitney U test). Appendix G on page 273 shows the median and range for the breastfeeding measures by cot type used.

[2] See Appendix G on page 273 for breastfeeding frequency per hour by side-car crib versus standalone cot use.

[3] The mean difference between side-car crib and standalone cot bedsharers (95% CI) was 0.54 (0.03 – 1.06), p = 0.089 (Mann-Whitney U test).

[4] Participant demographics by the groups from which bedsharers derived are presented in Appendix G on pages 274-275.

Proportion of breastfeeding during the observation period

Table 7.3 shows that the proportion of observed breastfeeding did not differ between the side-car crib and standalone cot allocation groups.[1]

Table 7.3: Proportion of breastfeeding during the observation period by the randomly allocated postnatal ward cot type (intention-to-treat analyses).

Participants	Side-car crib $n = 20$
	Standalone cot $n = 15$
	Median (range)
Proportion per observed hour:	
- Breastfeeding	0.14 (0.02 – 0.26)
	0.12 (0.00 – 0.29)
- Breastfeeding effort	0.16 (0.02 – 0.29)
	0.12 (0.00 – 0.31)
- Nipple stimulation	0.16 (0.02 – 0.29)
	0.13 (0.00 – 0.31)

Table 7.4 illustrates that bedsharing as the primary infant sleep location was positively associated with the proportion of breastfeeding during the observation period.[2]

Table 7.4: Proportion of breastfeeding during the observation period by the postnatal ward infant sleep location primarily used (on-treatment analyses).

Participants	Side-car crib $n = 13$
	Standalone cot $n = 11$
	Maternal bed $n = 11$
	Median (range)
Proportion per observed hour:	
- Breastfeeding*	0.10 (0.02 – 0.18)
	0.10 (0.00 – 0.24)
	0.20 (0.00 – 0.29)
- Breastfeeding effort*	0.12 (0.02 – 0.19)
	0.11 (0.00 – 0.25)
	0.20 (0.00 – 0.31)
- Nipple stimulation*	0.12 (0.02 – 0.19)
	0.12 (0.00 – 0.25)
	0.20 (0.00 – 0.31)

The asterisks represent variables that had statistical association at the $p \leq 0.05$ level.

The breastfeeding proportion measures were similar between the side-car crib and standalone cot use as the primary infant sleep location during the observation period.[3]

[1] The mean difference between side-car crib versus standalone cot allocation (95% CI) in breastfeeding was 0.02 (-0.04 – 0.08), p = 0.633 (Mann-Whitney U test); breastfeeding effort: 0.02 (-0.03 – 0.08), p = 0.610 (Mann-Whitney U test); and nipple stimulation: 0.02 (-0.04 – 0.07), p = 0.805 (Mann-Whitney U test).

[2] Bedsharing compared to standalone cot use as the primary infant sleep location, mean difference (95% CI), breastfeeding: 0.08 (0.01 – 0.15), p = 0.016; breastfeeding effort: 0.09 (0.01 – 0.16), p = 0.019; and nipple stimulation: 0.08 (0.003 – 0.15), p = 0.023. Bedsharing compared to side-car crib use, breastfeeding: 0.07 (0.02 – 0.13), p = 0.007; breastfeeding effort: 0.07 (0.02 – 0.13), p = 0.005; and nipple stimulation: 0.07 (0.02 – 0.13), p = 0.005. These p-values were calculated using the Mann-Whitney U test.

[3] Side-car crib compared to standalone cot use, breastfeeding: 0.01 (-0.04 – 0.07), p = 0.820; breastfeeding effort: 0.01 (-0.05 – 0.07), p = 0.776; and nipple stimulation 0.004 (-0.05 – 0.06), p = 0.955. These p-values were calculated using the Mann-Whitney U test.

Mother-infant interactions

The series of images below depict the difference in responding to infants enabled by the cot types. The side-car crib permits maternal-infant contact without the additional step of mothers repositioning themselves that is required with the standalone cot. The arrows indicate the infant location.

Images 7.3: Participant within reach of her infant. The mother places her hand on the baby in the side-car crib without moving herself.

Images 7.4: Participant beyond reach of her infant. The mother wakes, feels her incision wound as she twists and repositions herself then lays her hand on the baby in the standalone cot.

Proximity

Infants allocated to the standalone cots spent more time beyond their mothers' reach while in the same room compared to women who had the side-car crib.[1]

[1] Infant beyond mother's arm reach while mother in the same room: standalone cot versus sidecar crib allocation, mean difference (95% CI): 0.31 (0.14 – 0.49, p < 0.000 (Mann-Whitney U test).

The proportion of the observation period that participants were in contact with their infants or the time that mothers were in separate rooms than their infants did not vary between the allocated side-car crib and standalone cot groups.[1] The intention-to-treat results for the overall proximity measures are presented in Table 7.5.

Table 7.5: Overall maternal-infant proximity during the observation period by allocated postnatal ward cot type (intention-to-treat analyses).

Participants	Side-car crib $n = 20$
	Standalone cot $n = 15$
	Median (range)
Median observed proportion per hour:	
- In contact	0.55 (0.12 – 0.96)
	0.39 (0.12 – 0.89)
- Beyond mother's reach*	0.02 (0.00 – 0.63)
	0.26 (0.01 – 0.82)
- Different room	0.01 (0.00 – 0.18)
	0.03 (0.00 – 0.18)

The asterisk represents the variable that had statistical association at the $p \leq 0.05$ level.

Sleep amount

The proportion of infant sleep, maternal sleep or the time mothers and their infants spent sleeping in relation to the other's sleep state were not associated with the randomly allocated postnatal ward cot types, as shown in Table 7.6.[2]

Table 7.6: Maternal-infant sleep during the observation period by allocated postnatal ward cot type (intention-to-treat analyses).

Participants	Side-car crib $n = 20$
	Standalone cot $n = 15$
	Median (range)
Median proportion observed per hour:	
- Infant awake	0.40 (0.14 – 0.67)
	0.32 (0.08 – 0.82)
- Mom awake	0.43 (0.20 – 0.87)
	0.48 (0.17 – 0.85)

[1] Infant in contact with mother, side-car crib versus standalone cot allocation: 0.10 (-0.08 – 0.28), p = 0.230. Mother in separate room than infant, side-car crib versus standalone cot allocation: -0.001 (-0.04 – 0.03), p = 0.243. These p-values were calculated using the Mann-Whitney U test. The categories of proximity were mother and infant in contact, infant within mother's reach, infant beyond mother's reach when the mother was in the same room and mother in a different room than the infant (refer to the behavioural taxonomy, pp. 58-59). Therefore, the results in Table 7.5 are related, but not simply a reflection of each other.

[2] Side-car crib to standalone cot mean difference (95% CI), infant awake: 0.001 (-0.11 – 0.11), p = 1.0000; mother awake: -0.04 (-0.17 – 0.08), p = 0.484; sleep overlap, which was the proportion of the night during which both the mother and her infant were asleep: 0.10 (-0.02 – 0.23), p = 0.062; mother asleep but infant awake: -0.04 (-0.12 – 0.03), p = 0.443; and infant asleep but mother awake: -0.04 (-0.16 – 0.08), p = 0.527. These p-values were calculated using the Mann-Whitney U test.

Table 7.6: Maternal-infant sleep during the observation period by the randomly allocated postnatal ward cot type (intention-to-treat analyses) (continued).

- Sleep overlap	0.70 (0.18 – 0.82)
	0.49 (0.15 – 0.78)
- Mother asleep, infant awake	0.09 (0.00 – 0.24)
	0.09 (0.03 – 0.54)
- Infant asleep, mother awake	0.23 (0.07 – 0.73)
	0.32 (0.07 – 0.58)

These sleep variables were also statistically identical among the groups of participants by the infant sleep location primarily used during the observation period.[1]

Sleep characteristics

Infant and maternal sleep orientation were not different between those randomly allocated the side-car crib or standalone cot.[2] Most newborns and their mothers spent the majority of their sleep facing the other.

While the babies were asleep, the proportion of time that mothers and their infants were in contact did not vary by the randomly allocated postnatal ward cot type,[3] but the (sleeping) infants in the standalone cot arm of the trial spent more time beyond reach of their mothers than did those with the side-car crib.[4] The intention-to-treat data for sleep orientation and proximity are presented in Table 7.7.

Table 7.7: Maternal-infant sleep characteristics during the observation period by the randomly allocated postnatal ward cot type (intention-to-treat analyses).

Participants	Side-car crib $n = 20$ Standalone cot $n = 15$
	Median (range)
Median proportion observed per hour:	
- Asleep infant facing mother	0.79 (0.16 – 1.00)
	$n = 14$ 0.91 (0.07 – 1.00)
- Asleep mother facing infant	$n = 19$ 0.65 (0.41 – 1.00)
	0.67 (0.37 – 1.00)
- In contact when infant asleep	0.41 (0.02 – 0.97)
	0.25 (0.01 – 0.93)
- Beyond mother's reach when infant asleep*	0.01 (0.00 – 0.72)
	0.51 (0.01 – 0.93)

The asterisk represents the variable that had statistical association at the $p \leq 0.05$ level.

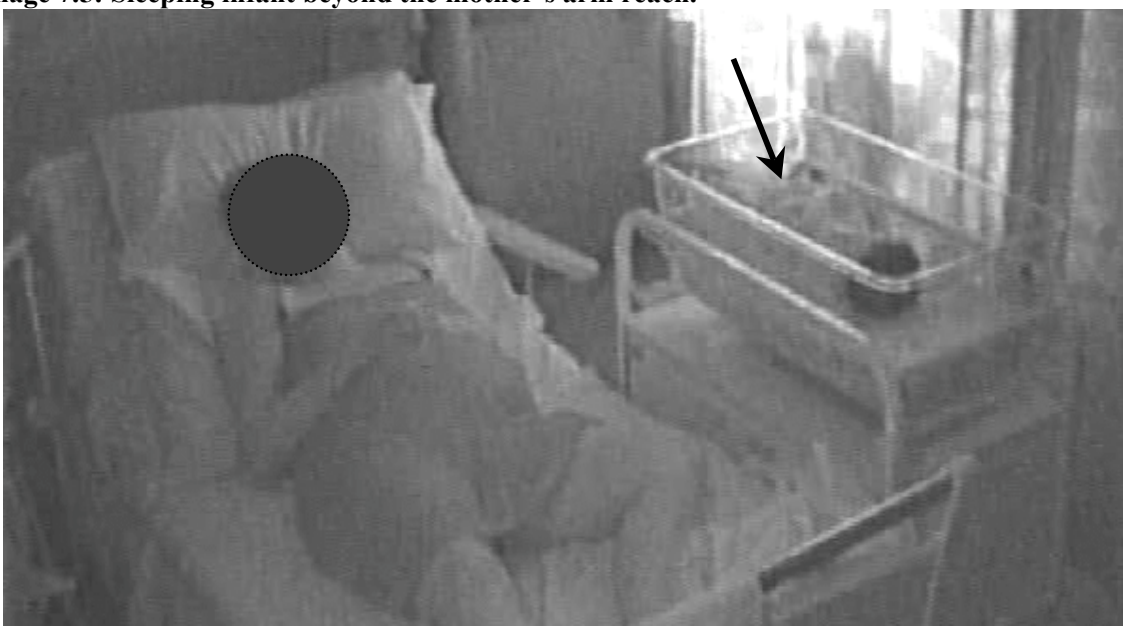
[1] See Appendix G on page 276 for the maternal-infant sleep results by on-treatment analyses.

[2] Infant sleep orientation, side-car crib versus standalone cot allocation: -0.02 (-0.19 – 0.15), p = .986 (Mann-Whitney U test) and maternal sleep orientation, side-car crib versus standalone cot allocation: 0.005 (-0.13 – 0.14), p = 0.931 (Mann-Whitney U test).

[3] Mother-infant in contact while infant asleep, side-car crib versus standalone cot allocation: 0.11 (-0.11 – 0.32), p = 0.257 (Mann-Whitney U test).

[4] Time spent beyond mother's reach while infant asleep, standalone cot versus side-car crib allocation: 0.39 (0.19 – 0.59), p < 0.000 (Mann-Whitney U test). The proximity measures when the infant asleep are not independent of the above-mentioned overall proximity that included awake and asleep time. The measure of proximity was not only due to the standalone cot structure, as participants who were sitting on the edge of the bed or lying on that side could reach their infants when the cot was positioned adjacent to the bed.

Image 7.5: Sleeping infant beyond the mother's arm reach.



Sleeping infants were in contact more with their bedsharing mothers than those using either cot type as the primary infant sleep location.[1] Additionally, the side-car crib sleeping infants spent less time beyond their mothers' reach compared to those primarily sleeping in the standalone cot.[2] Table 7.8 shows the results of these on-treatment analyses.

Table 7.8: Maternal-infant sleep characteristics during the observation period by cot type used (on-treatment analyses).

Participants	Side-car crib $n = 13$
	Standalone cot $n = 11$
	Maternal bed $n = 11$
	Median (range)
Median proportion observed per hour:	
- Asleep infant facing mother	0.69 (0.16 – 1.00)
	$n = 10$ 0.79 (0.07 – 1.00)
	0.93 (0.64 – 1.00)
- Asleep mother facing infant	$n = 12$ 0.64 (0.41 – 1.00)
	0.66 (0.37 – 1.00)
	0.55 (0.37 – 1.00)
- In contact when infant asleep*	0.36 (0.02 – 0.57)
	0.07 (0.01 – 0.40)
	0.82 (0.60 – 0.97)
- Beyond mother's reach when infant asleep*	0.01 (0.00 – 0.72)
	0.72 (0.01 – 0.93)
	0.02 (0.00 – 0.14)

The asterisks represent variables that had statistical association at the $p \leq 0.05$ level.

[1] Mother-infant in contact while infant asleep, bedshare versus standalone cot use: 0.63 (0.51 – 0.75), $p < 0.000$ (Mann-Whitney U test) and maternal bed versus side-car crib use: 0.51 (0.37 – 0.65), $p < 0.000$ (Mann-Whitney U test). There was not a difference in physical contact while infants were asleep between those using the side-car crib compared to the standalone cot: 0.12 (-0.03 – 0.27), $p = 0.140$ (Mann-Whitney U test).

[2] Time spent beyond mother's reach while infant asleep, side-car crib versus standalone cot primary use: -0.52 (-0.72 – -0.31), $p < 0.000$; maternal bed versus standalone cot primary use: -0.55 (-0.75 – -0.36), $p = 0.001$; side-car crib versus primarily maternal bed use: -0.54 (-0.16 – 0.09) $p = 0.235$. These p-values were calculated using the Mann-Whitney U test.

Sleep orientation among mothers and infants by the postnatal ward infant sleep location primarily used was similar.[1]

Midwifery presence

Midwives spent the same proportion of the observation period with mothers randomly allocated the side-car crib or standalone cot.[2]

Midwives were present with the bedsharing mothers for the same proportion as those who primarily used either cot type as the primary infant sleep location.[3] However, the midwives spent more time with mothers who used the standalone cot compared to side-car crib.[4] Table 7.9 shows the duration of midwifery presence with the participants by on-treatment analysis.

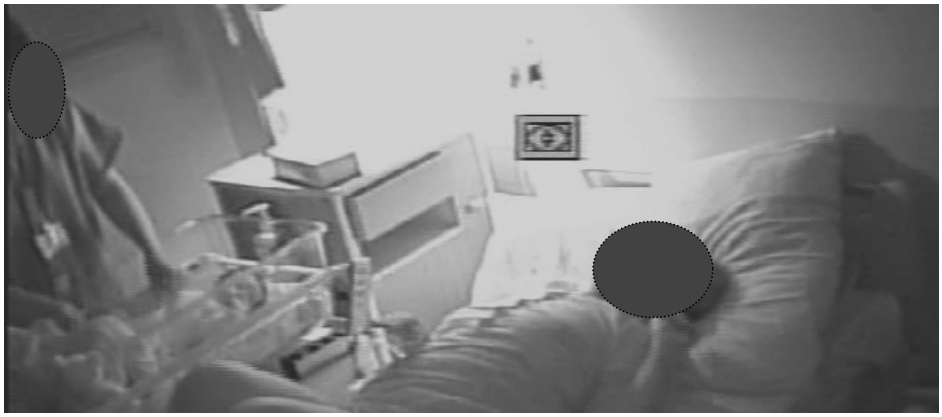
Table 7.9: Midwifery presence during the observation period by cot type primarily used as the infant sleep location (on-treatment analysis).

		Median (range)
Median proportion observed per hour:		
- Midwife in*	Side-car crib $n = 12$	0.002 (0.000 – 0.081)
	Standalone cot $n = 11$	0.021 (0.003 – 0.106)
	Maternal bed $n = 11$	0.011 (0.000 – 0.043)

The asterisk represents that the variable that had statistical association at the $p \leq 0.05$ level.

Image 7.6 illustrates the discomfort participants experienced while adjusting themselves and the subsequent necessity for midwifery support with infant caregiving when the mothers could not easily access their babies.

Image 7.6: Midwife changing the infant's nappy before handing the baby to the mother to breastfeed.



[1] Infant sleeping towards the mother, side-car crib versus standalone cot primary use as the infant sleep location: -0.007 (-0.24 – 0.23), p = 0.926; maternal bed versus standalone cot use: 0.16 (-0.04 – 0.35), p = 0.139; maternal bed versus side-car crib use: 0.17 (-0.007 – 0.34), p = 0.139. Mother sleeping towards the infant, side-car crib versus standalone cot use: 0.06 (-0.11 – 0.23), p = 0.601; maternal bed versus standalone cot use: 0.08 (-0.09 – 0.25), p = 0.393; maternal bed versus side-car crib use: 0.02 (-0.15 – 0.19), p = 0.644. These p-values were calculated using the Mann-Whitney U test.

[2] Midwife in the postnatal ward room, side-car crib to standalone cot allocation: -0.01 (-0.03 – 0.007), p = 0.063 (Mann-Whitney U test). The data are presented in Appendix G on page 276.

[3] Midwife in the postnatal ward room, maternal bed versus standalone cot use: -0.02 (-0.04 – 0.005), p = 0.105 (Mann-Whitney U test) and maternal bed versus side-car crib use: -0.001 (-0.02 – 0.02), p = 0.387 (Mann-Whitney U test).

[4] Midwife in the postnatal ward room, side-car crib versus standalone cot use: -0.02 (-0.04 – 0.007), p = 0.041 (Mann-Whitney U test).

Potential infant risk

No participants or their infants were observed, or otherwise documented, as having experienced harm. However, situations that put babies at risk arose in relation to infant sleep position and the interaction of the standalone cot structure with limited maternal mobility.

Infant sleep position

Three participants, two using the side-car crib and the other with the standalone cot, placed their sleeping infants prone on a mattress for a period of time. Refer to page 59 for an overview of the risk of infants sleeping on their stomachs.

Standalone cot structure

Images 7.7 and 7.8 show that the distance and height of the standalone cot led to some mothers to provide less support to their infants when moving them compared to the access enabled by the side-car crib. The arrows point to the infants' necks.

Image 7.7: The infant's head and neck are unsupported as she is lifted out of the standalone cot.

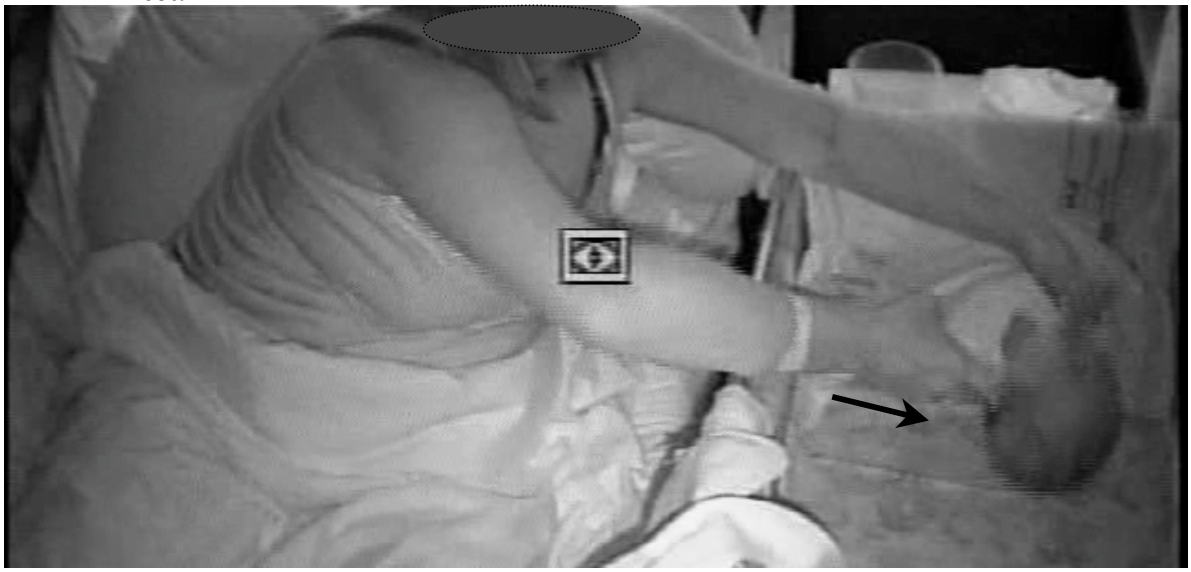
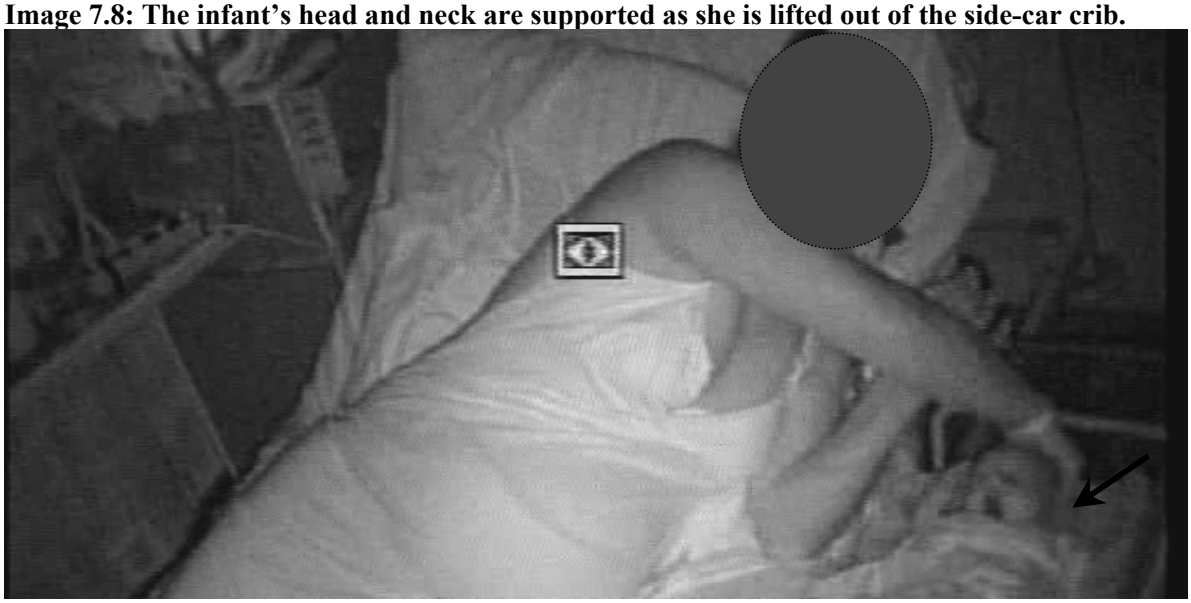


Image 7.8: The infant's head and neck are supported as she is lifted out of the side-car crib.



The two images below further illustrate the harm that could be incurred when mothers use the standalone cots when not getting out of bed. The arrow in Image 7.9 highlights the effect of the mother's weight on the standalone cot and the arrow in Image 7.10 indicates that the infant was above the surface of the standalone cot when contact with the mother was broken.

Image 7.9: The participant tips the standalone cot as she leans on it from her position on the bed.

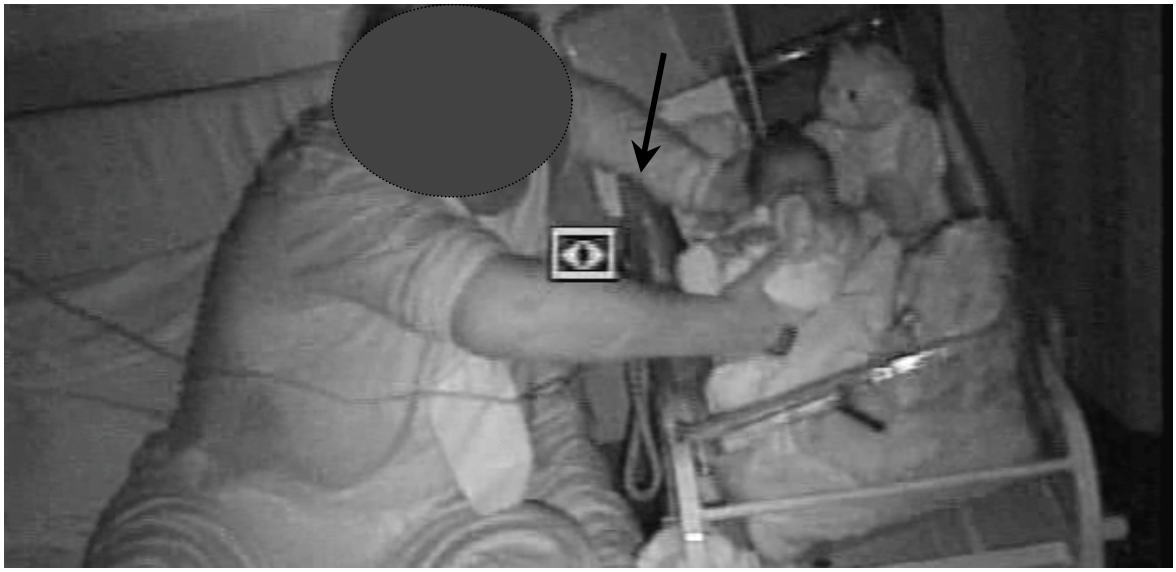
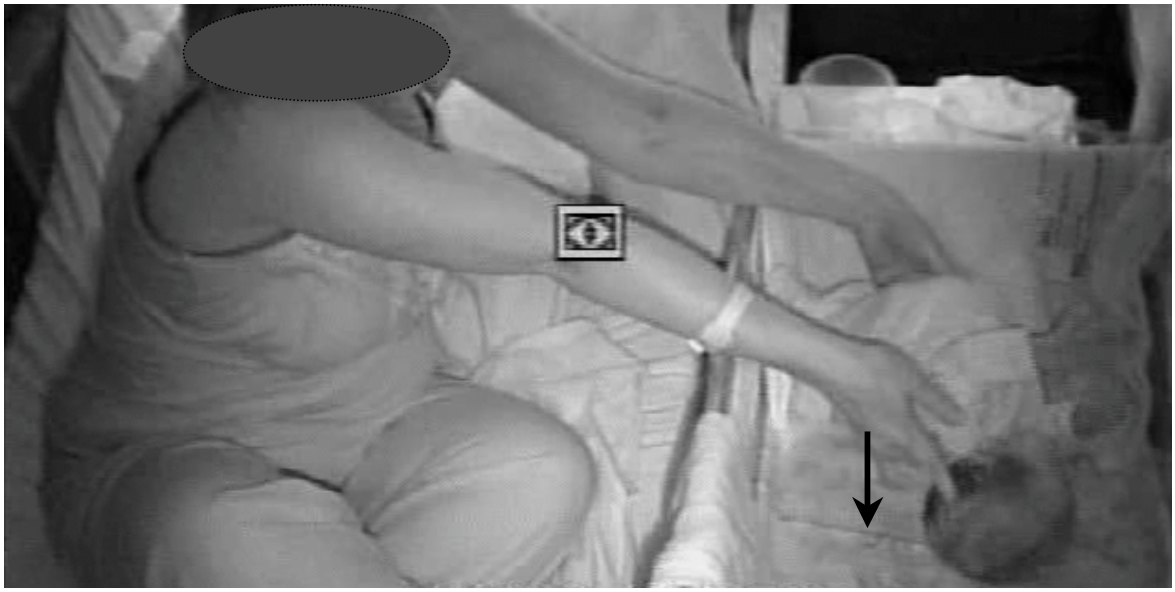
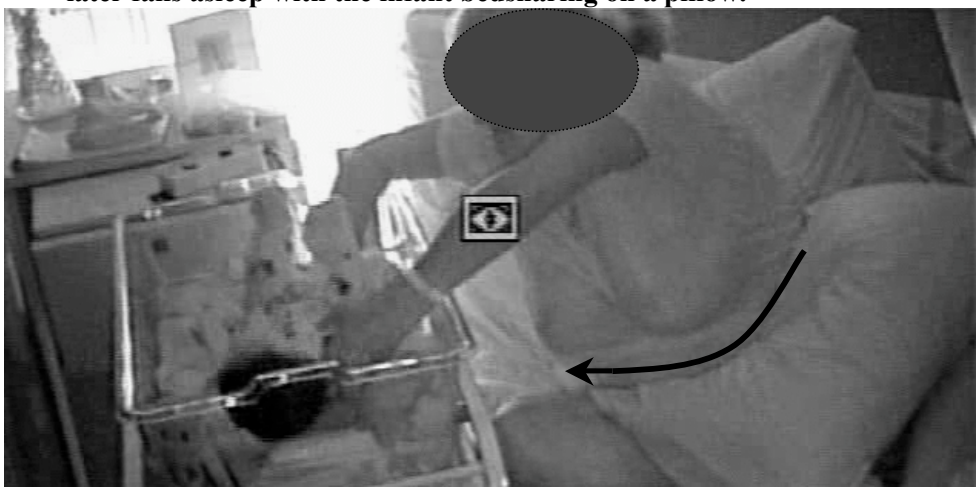


Image 7.10: The participant accidentally drops her infant a few inches into the standalone cot because she cannot maintain further contact with the infant from her position on the bed.



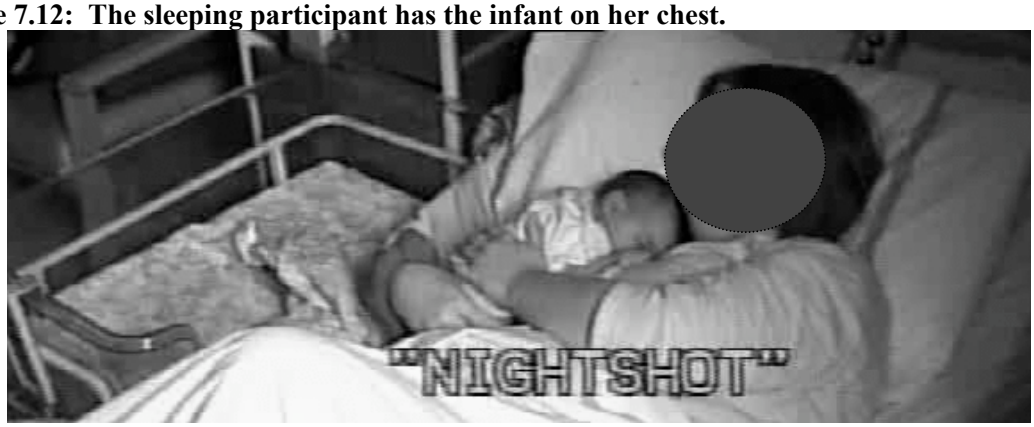
The following series of images show a participant grimacing as she twists and leans to get her infant from the standalone cot and then later bedsharing. The arrow illustrates the stretching of the woman's mid-section.

Images 7.11: The participant is in pain as she puts her infant into the standalone cot. She later falls asleep with the infant bedsharing on a pillow.



When infants were in the mother's bed, those randomly allocated the standalone cot spent more time on a pillow, as in the picture above, instead of being on the mattress or directly on the mother's body compared to those who had the side-car crib, as in Image 7.12.[1]

Image 7.12: The sleeping participant has the infant on her chest.



[1] Infant on a pillow while in the maternal bed, standalone cot versus sidecar crib allocation: 0.20 (0.04 – 0.35, p = 0.009 (Mann-Whitney U test). The median proportion among the standalone cot participants was 0.03 with a range of 0 – 0.88. The median proportion among the side-car crib allocated group was 0 with a range of 0.00 – 0.01.

Maternal mobility
Bedsharing was not included as a condition in the study because of safety concerns regarding the mobility and awareness of women who underwent caesarean section delivery. Although no risk situations were observed with the maternal bed, a participant did request that a midwife come to take her sleeping baby from next to her and place him in the standalone cot.

Limited maternal mobility may have contributed to a dangerous situation of a standalone cot user placing her infant on pillows on her lap to breastfeed while she sat on the edge of the bed. As she struggled to reposition herself, the infant precariously wobbled on top of the stack of pillows.

An indirect hazard of the standalone cot was the time it took women to reach their infants. This was a reoccurring cause of concern for me while coding the videotapes when I observed the babies regurgitating. For example, one participant instantly woke up when her infant started to cough and get sick, but it took her two minutes to electronically move her bed and then lean over enough to reach her infant and wipe his mouth. The slow maternal response capabilities within the context of infant 'mucous' also spontaneously arose in the interviews as a concern of the participants:

> "It would be better having an easier cot [other than standalone] to get him in and out. I've got to get up [out of bed] even just to drop in my hand. I had to press the button [to buzz for midwifery assistance]. He kept getting sick…so I had to get him. I was watching him at every cough…it was stressful. It wasn't like he was just wanting feeding and could wait."
>
> Phase 2 Part. 72. She had a scheduled 'prophylactic' caesarean section delivery and was randomly allocated the standalone cot.

Maternal responses to using the allocated cot type
In the short postnatal ward interview the morning after filming, I asked mothers "if they were happy with where their infant slept last night" and if they "had any problems with the arrangement" (Appendix C, p. 245). Responses were of overwhelming preference for the side-car crib. Participants who had the standalone cot spontaneously discussed that the intervention "would have made a huge difference" with their newborn interactions.

The advantages and drawbacks of the cot types that the participants offered are presented in Figure 7.2.

Figure 7.2: Maternal thoughts on the randomly allocated cot type.

Allocated side-car crib *n* = 20

Advantages:
- access infant without moving
  - have hand on infant
  - check diaper without disturbing baby
  - place infant back without waking him/her
  - less pain reaching baby
- see baby more easily
- spend night 'close' and 'together'
- call midwives less
- 'convenient' and 'easy'
- facilitate breastfeeding

Disadvantages:
- need standalone cot to push down hallway because unable to carry baby
- no storage space
- concern for 'floating' structure (uneasy that there was nothing underneath the side-car)
- takes up most of one side of the maternal bed
- mother still required to lean or twist to get baby

Allocated standalone cot *n* = 15

Advantages:
- separate space for infant when toddler sibling visits

Disadvantages:
- cannot access infant without getting out of bed
- too tall to easily reach baby
- see 'metal bar' instead of baby
- spent night with baby 'in bubble'
- require midwives to get/put back baby
- 'awkward' and 'clumsy'
- hinder breastfeeding

Image 7.13: Sleeping mother holding the hand of her infant in the side-car crib.

Image 7.14: Participant resting her head on the standalone cot.

Images 7.13 and 7.14 demonstrate why the participants reported the above-mentioned trade-offs for the cot types when used after scheduled caesarean section delivery. The mothers' experiences of touching the infants in the night greatly vary.

Participants recommended that the side-car crib be universally offered on the postnatal ward. Some said that they would not have kept the infant in their room for the entirety of the night without the side-car crib because it enabled them to better settle the infants. Additionally, some women said that they would not have managed to breastfeed without the access provided by the side-car crib:

> "The side-car is fantastic…really good to be honest. I'm very sore and if I had to sit up or stand up, I couldn't have done it [breastfeed in the night]."
> Ph. 2 Part. 32.

"Actually the side-car is really good. I can be a lot more responsive quicker. I pick him up straight away whereas takes me a good few minutes to get up out of bed. My little girl [previous baby] had been left crying [on the postnatal ward with the standalone cot]. I found this a lot easier. It was ideal when he was asleep. I could put my hand on him when niggled. I just had to get used to putting him in without moving his head so that he wouldn't wake up."

Ph. 2 Part. 69.

"The [standalone] cot wasn't especially good after a caesarean section. [It requires] a lot of twisting and bending forward which we aren't supposed to do. So, it's not the best. That's why the cot was empty at the end of the night. She was crying a lot so they [the midwives] had [at the participant's request] to take her."

Ph. 2 Part. 1600.

"I would sleep for 10-15 minutes, then my baby cried and I had to stand up. This [standalone] cot too hard [to use] so I brought her into bed. I can't pick up her up very easily. The side-car would've been much easier for a woman like me who had a caesarean section to get baby, give [breast] milk and set [the baby] back. It bothered me having to ring midwives every half hour in the night."

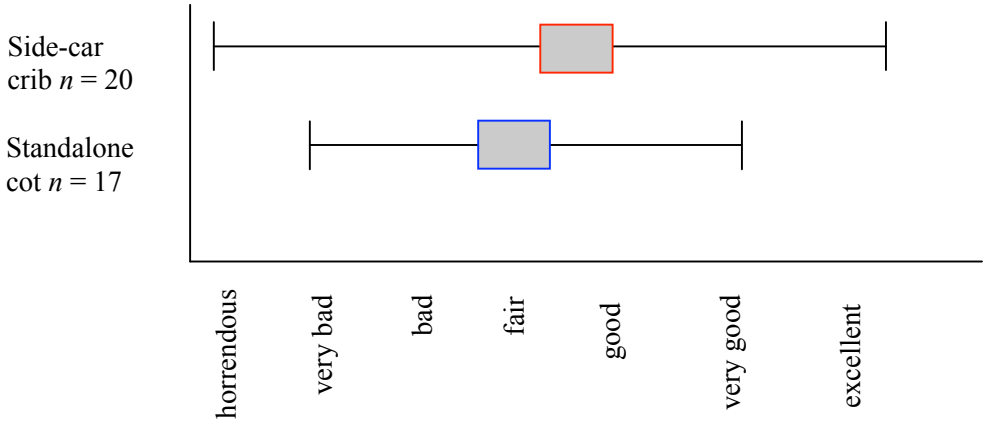
Ph. 2 Part. 43.

How women rated the observation night

The morning after filming, participants rated their night from the descriptions I provided of horrendous, very bad, bad, fair, good, very good or excellent. Overall, the median rating was fair and the range was the full scale.[1]

Graph 7.1 shows the intention-to-treat analysis results, with the median shown by the box and range of responses illustrated by the line. The ratings by randomly allocated postnatal ward cot type did not significantly vary.[2]

Graph 7.1: Maternal rating of the observation night by the randomly allocated postnatal ward cot type (intention-to-treat analysis).

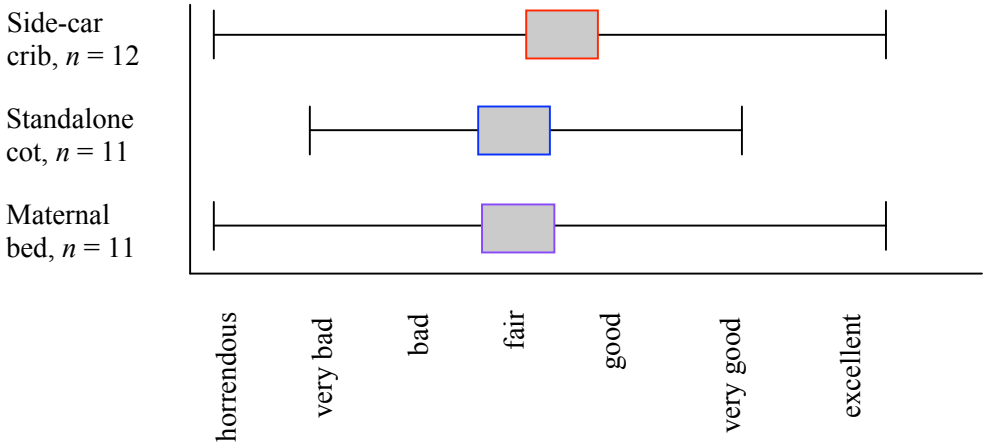


[1] The total number of participants who rated their second postpartum night was 37, including two who did not complete usable videotapes.

[2] Participants rated their night better than fair in 10 of 20 side-car crib and 6 of 17 standalone allocated cases, $x^2 = 0.3682$ $df = 1$ $p = 0.5440$. The total intention-to-treatment sample for night rating is 37 because some the morning interview did not have usable video data.

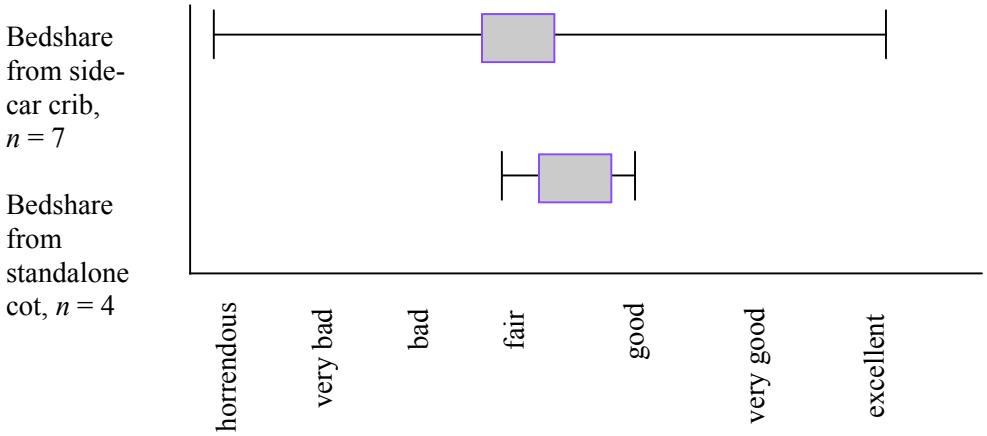
Graph 7.2 shows the results of the observation night rating by on-treatment analysis. Maternal satisfaction by cot type primarily used as the infant sleep location did not significantly vary from the overall median.[1]

Graph 7.2: Maternal rating of the observation night by the postnatal ward infant sleep location primarily used (on-treatment analysis).



Ratings by the cot groups from which bedsharers derived are presented in Graph 7.3. The 7 participants who bedshared instead of using the side-car crib had the same median rating, but a wider range, than those bedsharing from the standalone cot group. The difference between the small samples was not significant.[2]

Graph 7.3: Maternal rating of the observation night by the cot group from which bedsharers derived.



The rationale that women spontaneously offered for how they rated their observation nights was dominated by the amount of maternal sleep obtained, women's discomfort in manoeuvring themselves and the postnatal ward environment:

> "It was alright. I had a couple of hours rest. He was hungry [throughout the night]. He's breastfed, so he was awake quite a lot."
>
> Ph. 2 Part. 13. She had the standalone cot and rated the observation night 'fair.'

[1] Participants rated their night better than fair in 6 of 12 side-car crib use, 4 of 11 standalone cot use and in 5 of 11 bedsharing cases.

[2] Participants rated the night better than fair in 3 of 7 of the cases in which they primarily bedshared when the infant was asleep from side-car crib and 2 of 4 cases of bedsharing from standalone cot group.

"It was pretty awful…because of lack of sleep, not because of the cot. It was horrible. I only got about two to three hours of sleep. She was wanting to feed and wanting to be in bed with me."

Phase 2 Part. 3. She had the side-car crib and rated the observation night 'horrendous.'

"I got some sleep. There was a point [in the night] when I thought that I would need to give her to a midwife so that I could get some sleep but then she settled. The feeding wasn't so good during the night…baby was coughing with mucous."

Ph. 2 Part. 17. She had the side-car crib and rated the observation night 'fair.'

"Sleep is a major part of your recovery, isn't it. It was warm in ward and noisy…people walking up and down the hall and babies crying. It would be really great to have private room."

Ph. 2 Part. 1517. She had the standalone cot and rated night 'very bad.'

I explored whether the range of maternal satisfaction among the bedsharers was linked to the proportion of time these sub-samples of mothers were awake. Table 7.10 shows that bedsharing mothers from the side-car crib had a greater range of sleep time than those from the standalone cot, but the group medians were similar.

Table 7.10: The proportion of time mothers were awake during the observation period by the cot group from which they derived.

		Median (range)
Median proportion observed per hour:		
- Mother awake	Bedsharers from side-car crib *n* = 7	0.49 (0.25 – 0.87)
	Bedsharers from standalone cot *n* = 4	0.41 (0.17 – 0.45)

Results summary

The observed breastfeeding frequency per hour did not significantly vary by the randomly allocated postnatal ward cot type. Almost a third of the filmed participants primarily bedshared during the observation period. The rate of cross-over did not vary by whether they had the side-car crib or standalone cot.

Bedsharing as the primary infant sleep location was associated with more frequent breastfeeding during the observation period than those using the standalone cot or the side-car crib.

Standalone cot allocation was significantly associated with infants being beyond the reach of their mother, overall and when the newborns were asleep, compared to the side-car crib group. Neither the amount of sleep obtained nor the mother-infant sleep overlap varied by the postnatal ward cot type allocated or the arrangement primarily used as the infant sleep location. Additionally, newborns and their mothers generally slept facing each other.

Although the (spontaneous) bedsharing sub-sample was small, those who derived from the side-car crib breastfed a median of twice as frequently per hour compared to those who switched to bedsharing from the standalone cot. When infants were in the mother's bed, those who had been allocated the standalone cot spent a greater portion of time on a pillow instead of directly on the mother or on the mattress compared to those from the side-car crib. Participants who primarily used the standalone cot as the infant sleep location had the midwives in their room for a significantly greater proportion of the observation period than those who used the side-car crib. An interpretation of these results is that bedsharers from the standalone cot group slept with their infants more out of minimising maternal movement than to facilitate breastfeeding.

Potential infant risk was mainly due to limited maternal mobility while using the standalone cot. The combination of the height of the standalone cot and maternal attempts to remain stationary led to an infant's head being unsupported when moved, a standalone cot tipping under the pressure of a mother's arms and an infant being accidentally dropped a few inches into the cot. Participants described the standalone cot as "awkward" and "clumsy" and the observations indicate that it could be a hazardous arrangement when used after a scheduled caesarean section because of issues relating to the impaired access.

Women enumerated advantages and disadvantages to both cot types, but they advocated for universal provision of the postnatal ward side-car crib instead of the standalone cot. Access, vision, closeness, less need for midwifery assistance and breastfeeding facilitation were all spontaneously mentioned as benefits of the intervention.

The focus of maternal rating of the observation period was on sleep, as it is "a major part of your recovery." The emphasis on rest in maternal explanations of the rating and lack of significant difference in satisfaction with Night 1 by postnatal ward cot type allocated or primarily used as the infant sleep location were consistent with the finding that the proportion of time the mothers spent awake was similar across the groups.

Discussion

Efficacy of the side-car crib on increasing observed breastfeeding frequency

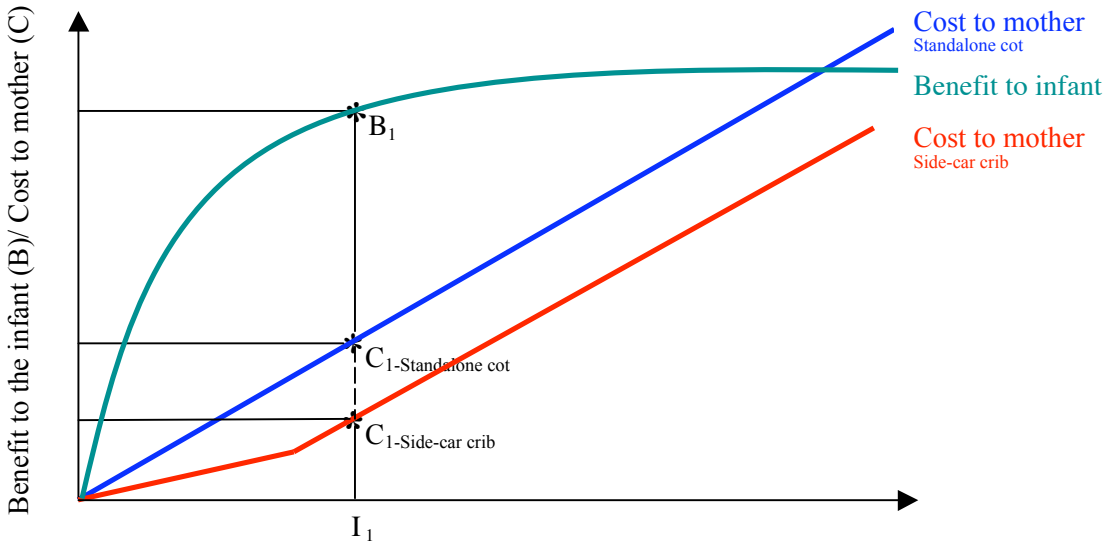
The predicted effect of the side-car crib on reducing the maternal cost of breastfeeding was demonstrated by overwhelming participant preference for the intervention compared to the standalone cot. Mothers reported that the side-car crib enabled them to visually and physically access their infants, enjoy their experience and cope with breastfeeding better

than those using the "awkward" and "difficult" standalone cot. Spontaneous attribution of the side-car to facilitating breastfeeding was forceful: "I couldn't have done it [breastfeeding] without it."

The frequency of breastfeeding sessions observed did not significantly differ between the groups randomly allocated the side-car crib or standalone cot. The proportion of the observation period in which participants were awake also did not vary by cot type allocated, so the lack of breastfeeding association is not a reflection of differential sleep amounts. Breastfeeding effort and the total stimulation to nipples' (breastfeeding, effort and expression) did not significantly vary by postnatal ward cot type allocation, indicating there may not have been differential hormonal profiles between the mothers. The possibility of this intervention on increasing prolactin levels among mothers in the early postpartum period is currently being tested by another Durham Sleep Laboratory researcher among mothers who underwent various modes of delivery (Robinson, in progress).

The data do not support rejection of the null hypothesis (refer to p. 31). The postnatal side-car crib may be ineffective at promoting breastfeeding frequency after a scheduled caesarean section compared to the standalone cot. Graph 7.4 models the Phase 2 results, which was a decrease in maternal cost that did not translate into an increase in breastfeeding frequency (which was representative of maternal investment).

Graph 7.4: Mother-infant health trade-offs with breastfeeding on the second postpartum night after a scheduled caesarean section delivery found in Phase 2. The side-car crib was associated with less maternal cost but did not result in increased breastfeeding investment compared to the standalone cot.



In Graph 7.4, the dotted line highlights the difference in maternal cost, $C_{1\text{-Standalone cot}}$ - $C_{1\text{-Side-car}}$ crib, at investment level I_1. The conclusion that the side-car crib did not promote breastfeeding on the postnatal ward after scheduled caesarean section delivery could be a type II error; the intervention may actually be effective at increasing the frequency of breastfeeding sessions in this population but lack of maternal investment among those participants allocated the side-car crib beyond I_1 (as predicted on p. 31) could be due to the various issues described below.

The foremost limitation of the Phase 2 results is that I was unable to obtain the sample size for which the power calculation estimated was necessary to detect a difference in

breastfeeding frequency if one occurred (refer to pp. 45-47). It is possible that a greater number of participants would have resulted in the difference in breastfeeding frequency between the two groups being statistically significant. Future research could conduct a similar study with a team of researchers over a greater period of time to more reliably measure the impact.

Comparison with the findings of Ball and colleagues (2006)

The more substantial issue, however, is that there could be a certain maximum level of cost that mothers are willing/able to devote to early breastfeeding. I found much less frequent breastfeeding among my participants who had scheduled caesarean section with spinal block anaesthesia than did Ball and colleagues (2006) with women who had vaginal delivery without opiate analgesics. Table 7.11 compared the intention-to-treat median and ranges.

Table 7.11: Comparison of Phase 2 and Ball and colleagues' (2006) results of breastfeeding session frequency per hour (intention-to-treat analysis).

		Median (range)
Breastfeeding frequency observed per hour:		
- Allocated side-car crib	Phase 2 $n = 20$	0.64 (0.12 – 1.61)
	Ball and colleagues $n = 23$	1.3 (0.0 – 7.3)
- Allocated standalone cot	Phase 2 $n = 15$	0.40 (0.00 – 1.07)
	Ball and colleagues $n = 20$	0.5 (0.0 – 6.6)

While the median breastfeeding frequency was similar in the standalone cot group, the ranges were much greater in both arms of the trial among those who had vaginal delivery. This is especially notable because Ball and colleagues used a lengthier interval to define breastfeeding sessions (refer to p. 45). The variance and the finding that the side-car crib groups had a median difference of twice as frequent breastfeeding sessions per hour suggest that there may be different trends in the data regardless of my smaller sample size.[1]

Different postnatal ward trade-offs after the experience of these birth modes could impact the effect size of the intervention and standard deviation of the outcome measure, which were assumptions in the power calculation. If the below issues are relevant, then my original sample size may have been an underestimation of the number of women needed to document an effect if one occurs. I propose four hypotheses for the difference between the results of Ball and colleagues (2006) and Phase 2 breastfeeding session frequency:

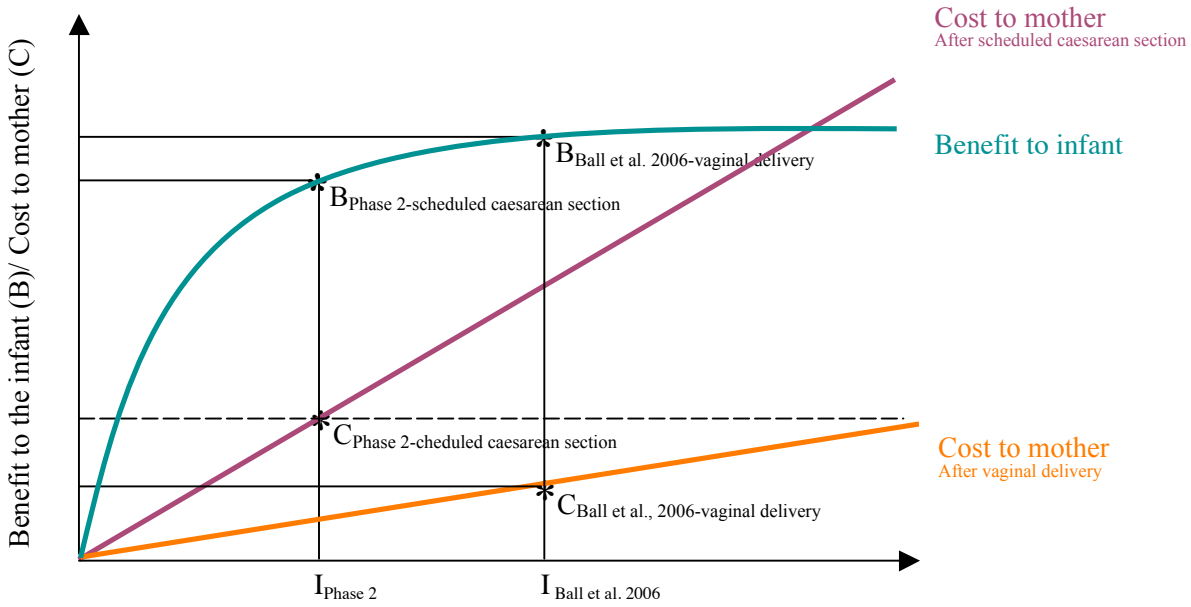
1. maternal cost of breastfeeding on the postnatal ward is greater after a scheduled caesarean section than vaginal delivery
2. infant benefit of breastfeeding is perceived as less after a scheduled caesarean section with spinal block anaestheisa than vaginal delivery without opiate analgesics
3. maternal cost and infant benefit are both experienced as described above
4. research methods may have contributed to particularly infrequent breastfeeding in my sample or particularly frequent sessions found by in Ball and colleagues

[1] Ball and colleagues (2006) also did not reach their powered sample size, by two participants.

Hypothesis 1: Differential maternal cost

The initial maternal experience of breastfeeding cost (psychological and/or physical) after a scheduled caesarean section delivery may be greater than post-vaginal delivery. The maternal challenges could override intentions for exclusive or any early breastfeeding.[1] Chapter 6 presented participant descriptions of intense pain associated with the manoeuvring required for them to breastfeed, whereas this hindrance could have been absent after vaginal delivery.[2] The maternal descriptions of postnatal ward infant feeding collected by Ball and colleagues are unpublished, so a comparison of the maternal-derived challenges to realising breastfeeding is not currently possible beyond a theoretical basis. I modelled the hypothesis of differential maternal cost of postnatal ward breastfeeding in Graph 7.5.

Graph 7.5: Mother-infant health trade-offs with breastfeeding at a certain point in time found in Phase 2 compared to the results of Ball and colleagues (2006). Hypothesis 1 to explain the difference: there was greater maternal cost after scheduled caesarean section than post-vaginal delivery.



In Graph 7.5, the marginal returns for those who experienced scheduled caesarean section delivery are less compared to after vaginal delivery. Maternal investment at $I_{Phase\ 2}$ corresponds to less frequent breastfeeding and at a greater maternal cost than at $I_{Ball\ et\ al.\ 2006}$. In economics terms, there could be a maternal 'cost ceiling' in the early postpartum period. The dotted line in Graph 7.5 represents this threshold, above which mothers will tend not to invest in their infants because the burden is too great.[3]

[1] Maternal perspectives on self-advantages of breastfeeding/lactation could also influence their birth mode intentions (and realisation). This may be an area for future investigation, especially with first-time mothers.

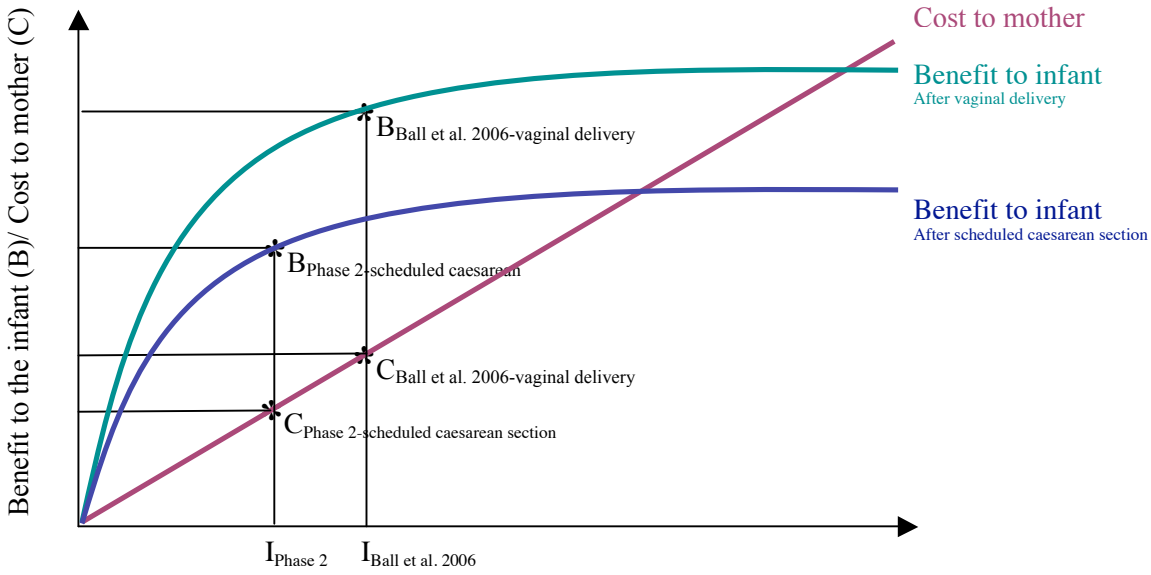
[2] Ball and colleagues (2006) do not report the incidence of pelvic floor tearing or other delivery complications that could have inhibited maternal mobility among their participants.

[3] A breastfeeding cost 'floor' would correspond to the minimum maternal investment required to provide biologically sufficient amounts of colostrum to the newborn. This may be at a level of breastfeeding frequency exhibited by participants allocated the standalone cot in both studies. The concepts of (price) ceilings and floors are detailed by Sloman and Wride (2009: 51-53).

Hypothesis 2: Differential infant benefit

The second potential reason for the difference between my findings and those of Ball and her co-researchers is that women perceive postnatal ward breastfeeding effort as conveying less infant benefit after scheduled caesarean section compared to post-vaginal delivery. As discussed in Chapter 6, some of my participants described lack of the newborns' interest and the babies' frequent regurgitation of 'mucous' as hindering feeding. Again, a direct comparison with Ball and colleagues is not available. Graph 7.6 shows the maternal postpartum cost of breastfeeding as identical after these modes of delivery while the infant benefit is shifted right after scheduled caesarean section delivery (with spinal block anaesthesia) compared to vaginal delivery (without opiate analgesics).

Graph 7.6: Mother-infant health trade-offs with breastfeeding at a certain point in time found in Phase 2 compared to the results of Ball and colleagues (2006). Hypothesis 2 to explain the difference: there was less perceived infant benefit after scheduled caesarean section than post-vaginal delivery.

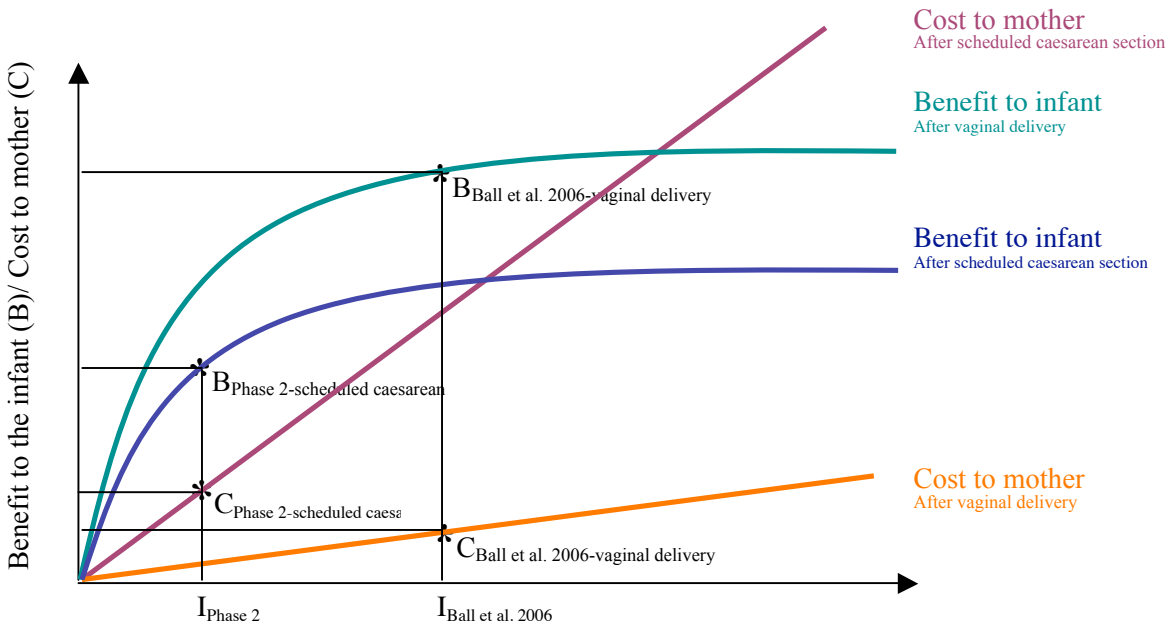


Marginal returns are after scheduled caesarean section compared to post-vaginal delivery, as in Graph 7.6. Maternal investment at $I_{Phase\ 2}$ corresponds to less frequent breastfeeding sessions and less infant benefit then at $I_{Ball\ et\ al.,\ 2006}$. Future research could compare maternal description of infant-derived breastfeeding obstacles and characterizations of newborn temperament by delivery mode experienced.

Hypothesis 3: Differential maternal cost and infant benefit

The difference in the results found in our two studies is most likely due to a combination of Hypotheses 1 and 2. Mothers may experience greater costs and perceive a lower degree of infant benefit with breastfeeding on the postnatal ward after scheduled caesarean section delivery than during this period after (this type of) vaginal delivery. Graph 7.7 models the possible circumstances that contributed to our breastfeeding frequency findings.

Graph 7.7: Mother-infant health trade-offs with breastfeeding at a certain point in time found in Phase 2 compared to the results of Ball and colleagues (2006). Hypothesis 3 to explain the difference: there was greater maternal cost and less perceived infant benefit after scheduled caesarean section than post-vaginal delivery.



This illustration predicts that mothers will tend to breastfeed less after scheduled caesarean with greater cost to themselves compared to those who experienced vaginal delivery. The model can be used as the theoretical basis of future interventions that aim to identify populations vulnerable to not realising breastfeeding intentions and to design interventions to support the process.

Hypothesis 4: Differential research methods

The final hypothesis I propose to account for the difference in observed breastfeeding frequency of postnatal ward breastfeeding is that the results are a reflection of different research methods.

I conducted face-to-face recruitment for most of the participants in Phase 2 (refer to pp. 50-51). This is in contrast to Ball and colleagues' (2006) recruitment by presenting verbal and written information to groups of women at hospital antenatal breastfeeding workshops. My discussion of the study with individuals (and their family/friends when applicable) and request for the women to consider participation may have resulted in some women enrolling who would not have done so if they had been approached in the less direct manner. This possibility is supported by the higher rate of enrolment I obtained through the face-to-face approach, 58%, compared to those who enrolled in the supplement through postal recruitment, 39%, and compared to Ball and colleagues estimated 35% with their group technique (refer to Chapter 4). Therefore, characteristics of the participants may have contributed the differential results.

Maternal age, maternal ethnicity, gestation length, newborn weight and APGAR scores were similar among the groups of participants in the studies. However, Ball and her co-researchers had an inclusion criterion of participants having not previously breastfeed post-hospital discharge whereas 70.6% of those who completed usable videotapes in Phase 2 had breastfed for at least six weeks. Therefore, it is possible that my participants breastfed

less frequently because they felt that they could achieve their intended breastfeeding duration despite initially breastfeeding relatively infrequently. Another possibility is that the relatively frequent breastfeeding among the vaginal delivery participants is a reflection of the prenatal breastfeeding workshop from which they were recruited into the study. However, this influence would be unlikely to significantly counter the breastfeeding experience of the scheduled caesarean section women.

Formula supplementation of newborns may have contributed to the difference in breastfeeding frequency. More of my filmed participants may have altered their feeding intervals with formula compared to the vaginal delivery participants. Exclusive infant feeding of breast milk has been documented in maternal diaries (n = 188 South Korean women) as being associated with more frequent feeding compared to infants fed only formula (Lee, 2000).[1] My results were of breastfeeding sessions that included some formula 'top-ups'[2] whereas breastfeeding exclusivity during the observation period was not reported by Ball and colleagues (2006).

As previously discussed (refer to pp. 80-82), the timing of receipt of the side-car crib after delivery may have led to less frequently breastfeeding among this arm of my trial. One of Ball's co-researchers, (KB), was a staff nurse at the study location. This and the fact that they filmed participants on both the first and second postpartum nights may have contributed to a greater proportion of their participants in this group receiving the intervention earlier and subsequently interacting with their infants more. However, 9 of their 61 participants were filmed on Night 1 only due to late notification of the delivery. It is possible that some of these dyads had been allocated the side-car crib and thus received it on Day 1. The timing of the side-car crib provision is not presented in their 2006 publication.

The randomised breastfeeding intervention among dyads who experienced vaginal delivery indicated a range of breastfeeds from 0 – 7.3 per hour among those allocated the side-car crib or standalone cot, whereas mine indicted a range of 0 – 1.6 per hour. As previously mentioned, comparison of these results is limited by our different definitions of breastfeeding sessions (refer to p. 45). However, the lengthier definition applied by Ball and colleagues (2006) would be expected to result in less frequent sessions, since feeding episodes that occurred between five and ten minutes would be counted as separate sessions in my analyses.

Data from McKenna, Mosko and Richard (1997) enable the only other similar comparison of breastfeeding frequency of which I am aware. Their study comprised an equivalent number of participants (n = 35 in total), employed the same medium for data collection of stationary, 'night-shot' video recording and data were coded using an ethogram upon which ours were based. The researchers reported the number of breastfeeding sessions[3] of their overnight observation of mother-infant interaction in a laboratory environment when the infants were between three and four months of age as 4.5 RB-BN, 3.0 RB-SN, 3.0 RS-BN and 2.0 RS-SN.[4] Although they did not present breastfeeding frequency as a rate per hour, this can be estimated for the groups by dividing the median number of sessions by the mean

[1] This research excluded women who were contemporaneously feeding their infants breast milk and formula.
[2] In Phase 2, there was not a difference in breastfeeding exclusivity by the postnatal ward cot type allocated or primarily used (refer to p. 120 and p. 134).
[3] As presented on page 45, I adopted the same ten-minute interval definition for breastfeeding sessions as used by McKenna, Mosko and Richard (1997).
[4] RB = routine bedsharer, RS = routine solitary sleeper, BN = bedsharing night in laboratory and SN = solitary night in laboratory.

observation time.[1] The calculation offers an approximate (pooled) measure of breastfeeding sessions per hour of 0.50 RB-BN, 0.33 RS-SN, 0.33 RS-BN and 0.22 RS-SN. The range of breastfeeding frequency found by McKenna, Mosko and Richard can be calculated in this manner as up to 1.43 sessions per hour.[2] The data are consistent with the median and ranges of Phase 2. This may be indication that the rates of breastfeeding frequency observed by Ball and colleagues (2006) were particularly high, but comparison across the three studies is limited by the sample sizes obtained, participant demographics and research methods.

The issues addressed in section illustrate the complexity of documenting mother-infant interactions and interpreting the results. The qualitative data in this thesis provide a deeper insight into breastfeeding after a caesarean section than quantitative documentation alone would have permitted. The results of Phase 2 and Ball and colleagues study may be clarified by future research into the various components of the mother-infant trade-offs in breastfeeding on the postnatal ward.

Bedsharing was associated with more frequent breastfeeding

Inference of the Phase 2 on-treatment results is impeded by the significant differences in maternal education by the type of infant sleep location primarily used. These characteristics, or some unrecorded variables, may have led to the more frequent breastfeeding sessions in the sub-sample, not the use of the maternal bed for infant sleep.

However, the finding that bedsharing was associated with more frequent breastfeeding and a greater duration of breastfeeding per observed hour compared to either cot type is consistent with the above-mentioned 'bedsharing promotes breastfeeding' results found by McKenna, Mosko and Richard (1997).

Ball and colleagues (2006) did not analyse their data by an on-treatment approach, despite a 31.1% cross-over from the postnatal ward rooming-in condition allocated to that primarily used,[3] because the intention-to-treat analysis showed significant differences.[4] Bedsharing allocation after vaginal delivery was associated with significantly more frequent breastfeeding sessions compared to those allocated the standalone cot during the observation period, $p = 0.003$. The researchers did not find a significant difference in breastfeeding frequency by side-car crib and bedsharing allocation, $p = 0.93$, but the side-car was associated with significantly more frequent observed sessions per hour than the standalone cot allocation, $p = 0.013$.

The side-car crib was deemed preferable to the maternal bed for infant sleep on the postnatal ward after vaginal delivery by Ball and her co-authors because there was a greater proportion of the observation time in which infant airways were covered in the group

[1] The total analysis time was 544.2 $\pm$ 40.0 minutes on the bedsharing night and 545.2 $\pm$ 39.3 on the solitary night. The appropriate way to calculate the group median and range of breastfeeding sessions per hour would be to analyse the individual participants' frequency per hours observed (refer to pp. 61-62).

[2] The most frequent number of breastfeeding sessions during an observation period was 12. Dividing this frequency by the minimum observation time in this (bedsharing) group (504.2 minutes), gives a frequency per hour of 1.43. However, because the data are pooled, it is unknown whether this participant's frequency corresponded to the upper end of the observation time (584.2 minutes). If this were the case, then the maximum range of breastfeeding frequency per hour would be 1.23. Their data presentation does not impact the results of the study, which were calculated using the non-parametric Mann-Whitney U test (presumably with the individual frequencies).

[3] Of the sixty-one filmed participants, nineteen were observed with in infant in an arrangement other than that allocated for the majority of the baby's sleep time. The researchers did not specify where the infants were moved to out of the two possible non-compliance locations of the maternal bed or standalone cot.

[4] As previously discussed, the intention-to-treat approach is the standard against which policy is based because it represents results expected in 'real-life' wide-scale application (refer to p. 6 and pp. 62-63).

allocated to bedshare compared to the side-car crib group, p = 0.030. Neither Phase 2 nor their breastfeeding intervention study was powered to detect a difference in infant risk with the postnatal ward infant rooming-in arrangements, but it is an issue of paramount concern when considering the health trade-offs. The ability to identify a hazardous situation (or one developing) was limited in our research by the inability to alter camera zoom or angle during the recording, as discussed by Ball and colleagues (2006: 15). I did not observe instances of breathing risk, but a few sleeping infants were placed prone on a mattress for a period of time. Provision (or stronger emphasis) of the physiological basis underlying recommendations for the supine infant sleep position may be helpful for mothers in understanding why prone infant sleep is a SIDS risk.

Results from both the vaginal delivery and scheduled caesarean section trials indicate that the use of the infant arrangements, not necessarily the structures themselves, is essential for predicting infant risk. Ball and her co-authors reported that the infant who experienced the most frequent breathing risk in their study had been allocated to the maternal bed, but the airway coverings occurred when the newborn was swaddled in the standalone cot (2006: 14). The environments in which infants sleep, not a general labelling of the location in which they are placed, have been discussed as integral for research into infant safety by McKenna.[1] My data suggest that the standalone cot, when used by mothers on the postnatal ward after a scheduled caesarean section, may impose risk to the newborns because women are unable to access their babies without first substantially repositioning themselves.

Maternal statements of breastfeeding obstacles, their reflection on the cot type used and the video observation of their night-time interactions demonstrate that the standalone cot after scheduled caesarean section does not comply with the WHO recommendation of having newborns at least "within easy reach" of their mothers (2006: J10). Bedsharing was not included as a randomised arm in Phase 2 because of my concern regarding the safety the practice after scheduled caesarean section delivery (refer to p. 30). However, its spontaneous practice among participants reinforces the importance of providing bedsharing information to all parents, regardless of their intended postnatal rooming-in arrangement.

Bedsharing has been discussed as promoting breastfeeding through minimising maternal cost of night-time feeding through convenience and also reducing maternal pain/discomfort in the early postpartum period (Ball, 2002; Ball, 2008; McKenna, Mosko, and Richard, 1997).[2] The maternal position in which breastfeeding is most comfortable, suggested by Buswell and Spatz (2007) as a side-lying position after a caesarean section, may also unintentionally lead to bedsharing. Oxytocin that is released in the mother in response to the infant may contribute to her falling asleep (refer to p. 26). Although I did not observe any hazardous situations, bedsharing may convey potential risk for newborns after a caesarean section delivery due to their mother's limited ability to quickly manoeuvre. If bedsharing on the postnatal ward is to be considered for post-caesarean section delivery, future studies may want to explore women's perceptions of their ability to move in bed. Regardless of bedsharing promotion, postnatal ward safety may be improved by anticipation of unintended bedsharing and reconsideration of the width/height of maternal beds and the use of infant-safe bed rails.

[1] See McKenna, Ball and Gettler (2007), McKenna and McDade (2005), McKenna and Mosko (2001), McKenna (2001), Mosko, Richard and McKenna (1997), Mosko, Richard and McKenna (1997) and McKenna and colleagues (1993).

[2] A presented on page 81, McKenna also hypothesises that mother-infant processes, such as arousals from sleep, synchronise with routine close night-time contact among breastfeeding dyads. See McKenna and colleagues (1990), McKenna and colleagues (1993) and Mosko, Richard and McKenna (1997).

Although bedsharing for the majority of the observation period was common with both groups of my participants, it may have occurred for different reasons. Participants who bedshared from the side-car group breastfed more frequently than those who primarily bedshared from the standalone cot group. This, in combination with the infants from the standalone cot allocation spending significantly more time sleeping on a pillow when in the maternal bed, suggests limited maternal mobility may have played a role in bedsharing.

Pillow use may have been a reflection of the unintended result of mothers falling asleep before mustering the effort to move (themselves and then) the infant back to the standalone cot. This could be in contrast to the side-car crib bedsharers keeping the infants in contact because of maternal preference. The possibility is consistent with the finding that midwives were present among those who used the standalone cot as the primary infant sleep location more than those who bedshared or used the side-car crib. If an infant is on a pillow after the mother used it for breastfeeding positioning, then it is not surprising that she might nod off before becoming uncomfortable in moving the infant to the standalone cot. This series of events could result in risk to the baby if the mother is not prepared for this endpoint. Additionally, if mothers do not request (or would like) as much midwifery support with side-car crib provision, then this has implications for staff workload, midwifery satisfaction and hospital finances.

Callahan, Séjourné and Denis (2006) noted that maternal fatigue ratings did not vary by birth mode and suggest that women can be assured that breastfeeding after a caesarean section should not hinder their recovery. However, the results in this chapter suggest that maternal recovery and mother-infant interaction after a scheduled caesarean section are inhibited by the standalone cot rooming-in arrangement compared to that with the side-car crib. When Churchill, Savage and Francome (2006) asked British women if they considered "that you suffered as a result of a caesarean" their responses included themes similar to my findings of maternal pain, frustration from difficulty accessing the infant and distress from "feeling a nuisance having to ask [the midwives for assistance]…in lift[ing] her[the baby] out of the cot" (p. 143). Maternal discomfort may be central to the night-time interactions after scheduled caesarean section delivery, which led to some potentially risky situations of the infant being dropped (a few inches) and the standalone cot tipping. If women continue to be offered only the standalone cot for rooming-in, then caution to mothers regarding the possibility of sub-optimal infant handling as a consequence of their condition may be warranted.

Further research into the commonness and implications of infant lung fluid after scheduled caesarean section delivery may benefit from a focus on night-time interactions. Maternal tiredness, lack of mobility and/or lack of awareness about the state of their infant's breathing may render newborns at risk for asphyxiation in the rare situations in which the need for immediate care may arise. Mothers described the importance of the ease of infant interaction, but the access may be a public health concern beyond support of their emotional well-being.

Maternal sleep, satisfaction and frustration

The conceptualisation of expected and appropriate night-time infant behaviour is important because the quality of maternal sleep dominated observation night ratings and the perception of problems with infant satiation and subsequent lack of lengthy sleep bouts led some mothers and midwives to determine formula supplementation was the best response to the conundrum. In addition to these cases observed in Phase 2, the misappropriation of

normal human behaviour features in research studies as well.[1] Many health professionals lack adequate training in infant development and behaviour, and so cultural norms feature in their construction of 'problematic' sleep (Jenni and O'Connor, 2005).

The finding that observation nights rating did not significantly vary by cot types allocated (as in Ball et al., 2006) or used (on-treatment data was not published in Ball et al., 2006) is consistent with the lack of different maternal sleep obtained among the groups. A main concern voiced against postnatal ward rooming-in is maternal concern for rest (Rice, 2000). In interviews with Asian women in Victoria, Australia (n = 43), Rice found that they described the early postpartum period as vulnerable the most vulnerable period in a woman's life, with implication for their short- and long-term well-being.[2] These women were confused by the expectation that they perform all of caregiving for the babies while rooming-in because the mothers perceived their own rest as vital and achievable only in a non-mobilised state. Rice concludes that, especially after a difficult birth, maternal recovery is paramount, with rooming-in (with the standalone cot) imposing a burden on some women when they are weak and in pain. The side-car crib may lessen conflict among women's need for recovery, their desire to look after their newborns, infant needs for frequent breastfeeding (and other tending) and hospital staff roles.

I suggest that the side-car crib intervention is offered to mothers after scheduled caesarean section delivery due to participants' preference, the finding that it does not reduce the frequency of early breastfeeding sessions and the possibility of less infant risk situations. Another randomised controlled trial that aimed to increase breastfeeding initiation and duration recommended the intervention be implemented despite their data failing to support an impact on the infant feeding outcomes. Carfoot, Williamson and Dickson (2005) found that mothers in England (n = 197) reported much greater satisfaction with the intervention of extended skin-to-skin contact at delivery compared to the control experience of infant wrapping, $p \leq 0.001$. The researchers found that 86% of the participants in the intervention group said that they would prefer to receive the same care in the future compared with 30% in the control arm of the trial, $p \leq 001$. Because there were no detrimental impacts of the skin-to-skin care, as measured by infant temperature, the authors recommend the skin-to-skin protocol be implemented because of women's preference.

Summary

The side-car crib breastfeeding intervention is an example of how evolutionary medicine can be applied to clinical research. The purpose of the randomised controlled trial was to ameliorate disruption from a 'mismatch' between evolved maternal-newborn processes and routine experiences. Although the results did not support rejection of the null hypothesis, the data enabled me to propose various hypotheses about breastfeeding trade-offs that can be explored in future research.

Infant safety seems compromised with standalone cot provision after a scheduled caesarean section compared to providing mothers with the side-car crib. This potential for risk illustrates the importance of researching how infant care practices are experienced within certain populations.

---

[1] For example, see Anuntaseree and colleagues (2008) and Wake and colleagues (2006). These researchers do not acknowledge that the 'cry-fuss and sleep problems' they had parents document were not necessarily representative of infant issues. Their conclusion that clinicians can assure parents that such "problem behaviors are likely to be transient" (Wake et al., 2006: 841) ignores the possibility that there were never biological, and therefore clinical, issues with the children. The source concern may often actually be the effects that typical human infant behaviour has on parents. McKenna (2000) discusses the cultural influences on research of infant sleep.

[2] Ellison (2001) similarly suggests that over the course of human evolution, the time around parturition and the early postpartum period would have been the most perilous for women and their infants (p. 53).

Maternal tiredness and sleep dominated women's discussion of their satisfaction on the postnatal ward, highlighting the need to consider both infant and maternal needs when conceptualising supportive postnatal environments.

Chapter 8 presents that mothers' needs for self care also feature in their home breastfeeding behaviour, with the recurring theme of tiredness offered to justify supplementation of breast milk or adoption of parent-infant bedsharing. Participants' perspectives of infant feeding method trade-offs may also impact breastfeeding duration, as those who cited self-advantages were significantly associated with breastfeeding at some points over the first six months compared to those who reported infant-only reasons.

Chapter 8: Home breastfeeding following a caesarean section

This final results chapter covers maternal descriptions of their plans for home infant care, reported breastfeeding obstacles over the first six months, breastfeeding duration and parent-infant bedsharing.

Plans for infant care

Breastfeeding commitment

Most women planned to continue breastfeeding after hospital discharge.[1] The type of caesarean section delivery that participants underwent was not associated with terminating breastfeeding while in the hospital,[2] but the reported reasons for breastfeeding intent were significantly associated with breastfeeding continuation post-discharge.[3]

Many women were uncertain about how long they would breastfeed. The indefinite responses[4] hinged on infant weight gain, infant satiation, sufficient milk production and just "seeing how it goes":

> "Depends on [baby's] weight."
>
> Ph. 1 Part. 65. She intended to breastfeed for infant reasons and had breastfed her previous, caesarean-section delivered child for five weeks.

> "Probably 6 months if I can. I may give formula. If [the baby is] satisfied with breast milk then will just have the odd bottle of formula."
>
> Ph. 2 Part. 63, She intended to breastfeed for infant and maternal reasons and had breastfed her previous, caesarean section-delivered child for five and a half months.

> "As long as there is milk in my breast."
>
> Ph. 1 Part. 17. She intended to breastfeed for infant reasons and had breastfed her previous, vaginally-delivered child for one day.

> "I'm not sure…until it looks as though it's not enough for him."
>
> Ph. 2 Part. 50. She intended to breastfeed for infant and maternal reasons and had not breastfed her previous, caesarean section-delivered child.

[1] Of the 46 Phase 1 women who had prenatally intended to breastfeed and delivered healthy infants, 37 said that they planned to breastfeed after hospital discharge (80.4%). Among the 40 Phase 2 women who were interviewed on the postnatal ward, 36 said that they planned to breastfeed after hospital discharge (90%). An additional 5 NECOT participants said that they intended to continue breastfeeding, as well as: 3 participants who were not interviewed on the postnatal ward due to having visitors or sleeping and 2 women who were discharged early.

[2] Five of the 9 who ceased breastfeeding in the hospital underwent an unscheduled caesarean section delivery (5/30 = 16.7% of unscheduled breastfeeding sample) while the other 4 had scheduled caesarean section deliveries (4/16 = 25% of the scheduled breastfeeding sample), $p = 0.6982$ (Fisher's Exact test).

[3] Termination of breastfeeding in the hospital was reported by 8 of 24 'infant-only' versus 1 of 22 'maternal included' Phase 1 participants, $p = 0.0233$ (Fisher's Exact test). The relationship was not supported by Phase 2 data, with 3 of 16 'infant-only' switching feeding methods compared to 1 of 24 women who ceased breastfeeding and had discussed maternal intent, $p = 0.2832$ (Fisher's Exact test). However, the Phase 2 participants were recruited in the study partly on the basis of their breastfeeding intent.

[4] Indefinite plans for the duration of breastfeeding were described by 20 of 37 Phase 1 (54.1%) and 16 of 33 Phase 2 (48.5%) participants when asked "how long do you plan to continue" during the postnatal ward interview (Appendix A, p. 230, and Appendix C, p. 243).

Home infant sleep location

Few participants planned to have their babies sleep in separate rooms when first coming home from the hospital.[1] In response to "what factors influenced this decision," reasoning was either because this infant sleep location was an option or a deliberate attempt to minimise parental sleep disturbance:

> "In his cot in his own bedroom. We just had a spare bedroom, so.."
>
> Ph. 1 Part. 68. She had one other child and was planning to formula feed at home.

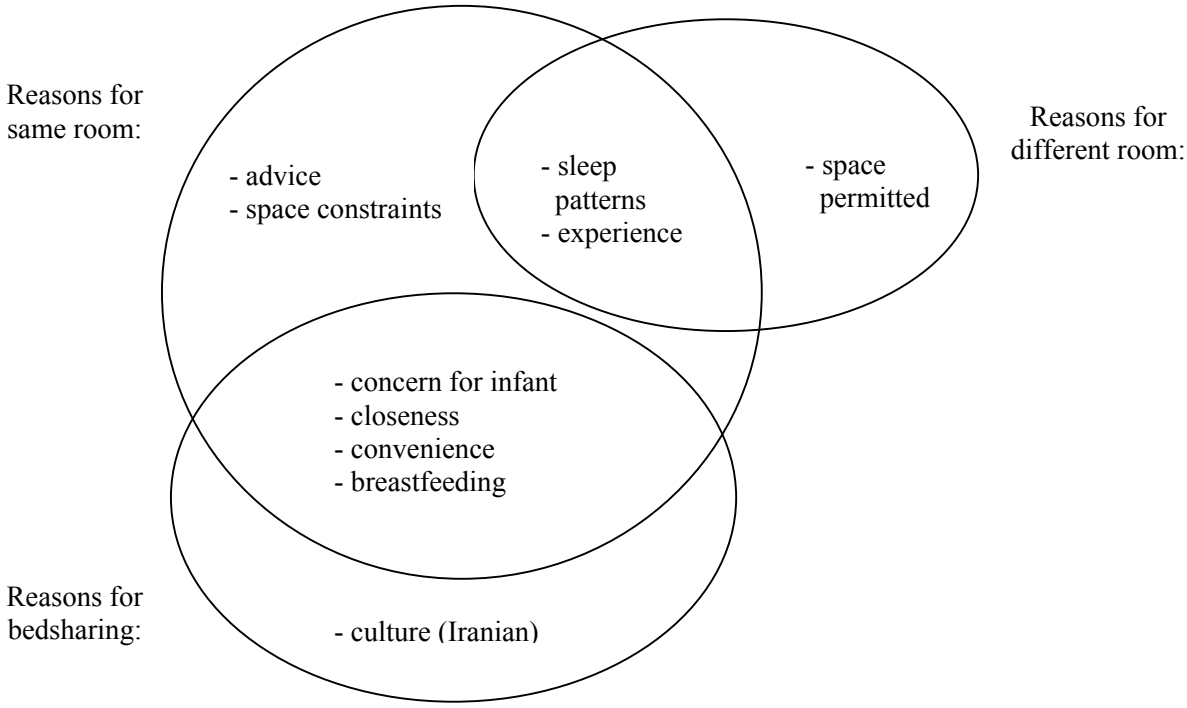
> "She has her own room adjoining ours. We wanted to get the baby room ready. It's all furnished and waiting for her."
>
> Ph. 1 Part. 11. She had one other child and was planning to formula feed at home.

> "Cot in a different bedroom. It's quite important to get your sleep and the baby's routine is established. We just start out how mean to go on."
>
> Ph. 1 Part. 43. She had two other children and was breastfeeding. Her feeding plan was "hopefully more breast milk than formula…just see how it goes. Will probably use bottle in night for efficiency."

> "Moses basket in [baby's] own room…nowhere near us so [we] can sleep. Had first baby had next to our bed but only lasted one night because of our disturbed sleep.
>
> Ph. 2 Part. 17. The grandmother was present and laughed at this response. She said that [a separate room for the infants] is what she had done with the woman too. The participant was planning to continue breastfeeding at home.

The factors mothers reported as influencing their planned infant sleep location are presented in Figure 8.1.

Figure 8.1: Maternally reported reasons for the planned home infant sleep location.



[1] Intention for the night-time infant sleep location to be in a separate room was reported by 4 of 75 Phase 1 (5.3%) and 1 of 37 Phase 2 (2.7%) participants.

Home breastfeeding obstacles

Interrelated challenges for the mother

Home breastfeeding difficulties caused concern among the participants, with ramifications for the mother's feelings as well as maternal-infant health. Many women affirmed (see Appendix E, p. 254) that they felt frustrated or upset. These participants spontaneously explained these feelings were due to the interrelated challenges of infant caregiving and recuperating from the caesarean section:[1]

> [At two weeks] "Yes, with breastfeeding because of how tiring it is."
>
> Ph. 2 Part. 6. She was breastfeeding at six months and had done so exclusively for six weeks.

> [At two weeks] "Yes, I'm still uncomfortable from the operation. It's frustrating not being able to do things. My recovery is going alright, I just get frustrated that it's not as quickly as I would like."
>
> Ph. 1 Part. 26. She breastfed for nine weeks, none of which were exclusive of formula.

> [At two weeks] "The first day home was hectic because I couldn't move. Now it's better. Things are hard but by my husband is at home. He cooks and cleans. My recovery going slowly in my opinion, but everyone says it needs time. I wish it were quicker. I'm a bit upset sometimes…and regret that the caesarean was necessary to do. I'm not able to get to my baby or bathe. [I'm upset due to] the fact that I was not allowed by destiny to have a normal life.
>
> Ph. 1 Part. 27. She had an unscheduled caesarean for breech positioning and non-progressive labour.

> [At three weeks] "Yes, I've got baby blues. It's hard to accept that I'm not going to breastfeed. It's amazing how much I wanted to…real interest there. I had milk pouring out of my breast and she didn't want it. It's like being rejected. I'm frustrated because I'm perplexed with what it is that she wants [when crying]."
>
> Ph. 2 Part. 42. She breastfed for one week while also expressing and supplementing with formula.

Maternal tiredness

Maternal tiredness commonly factored into women's infant feeding descriptions:[2]

> [At twenty weeks] "My baby doesn't like to sleep too much. I haven't figured out why. I'm confused and tired because she won't go to sleep. Somehow I really need someone to look after her so I can sleep. I am very upset...tired and very weak. I do not have enough milk for her. I have to give her bottle. She goes to sleep after breastfeeding then after three hours I give a bottle. I don't like to feed her with other milk, but she is crying and I want her to sleep very well."
>
> Ph. 2 Part. 43. She breastfed for fifteen weeks, none of which were exclusive of formula

> [At two weeks] "Yes, I'm tired. She gets bottles [of expressed breast milk and also formula] just if I'm exhausted [instead of breastfeeding]. My partner helps out. It's not a particularly regular pattern. She wants to feed all of the time."

[1] Women reported being frustrated or upset with home infant feeding at some point in 5 of 15 Phase 1 (33.3%) and 20 of 42 Phase 2 (47.6%) cases.

[2] Participants mentioned tiredness spontaneously or elaborated on it from the list of feelings in 8 of 15 Phase 1 (53.3%) and 32 of 42 Phase 2 (76.2%) cases over their six months.

[At six weeks] "There's longer in between night-time feeds now, so that's good...a relief."
[At eight weeks] "She's taking more food and sleeps more...part of her natural development.
[At twenty-two weeks] "She sleeps through the night now so no need for bedsharing [anymore].
[At twenty-four weeks] "I'm not tired."

Ph. 1 Part. 26. She breastfed for nine weeks, none of which were exclusive of formula. On the postnatal ward, she was "hoping to breastfeed for six months to a year, if it continues to go well."

[At four weeks] "Yes, I'm tired."
[At ten weeks] "I'm exhausted. I'm tired on inside as well. I don't feel depressed, but am a bit low…there's so much to do."
[At fourteen weeks] "I'm absolutely knackered. I feel well, just tired all of the time…it doesn't let up."
[At twenty-one weeks] "Yes, I'm tired."

Ph. 2 Part. 69. She was breastfeeding at twenty-one weeks [the last week that data were obtained]. She supplemented breastfeeding with formula starting in the hospital because "I was desperate, I was really sore" and she continued because he was "used to having a little extra." However, at ten weeks postpartum she exclusively breastfed and continued until twenty-one weeks. She had reintroduced formula due to "really bad feeding at night...it was quite frequent. I was exhausted."

In response to "if anything is influencing the way you are looking after your baby," imposed structure on infant feeding and sleep were brought up, including citation of the British childcare author Gina Ford.[1]

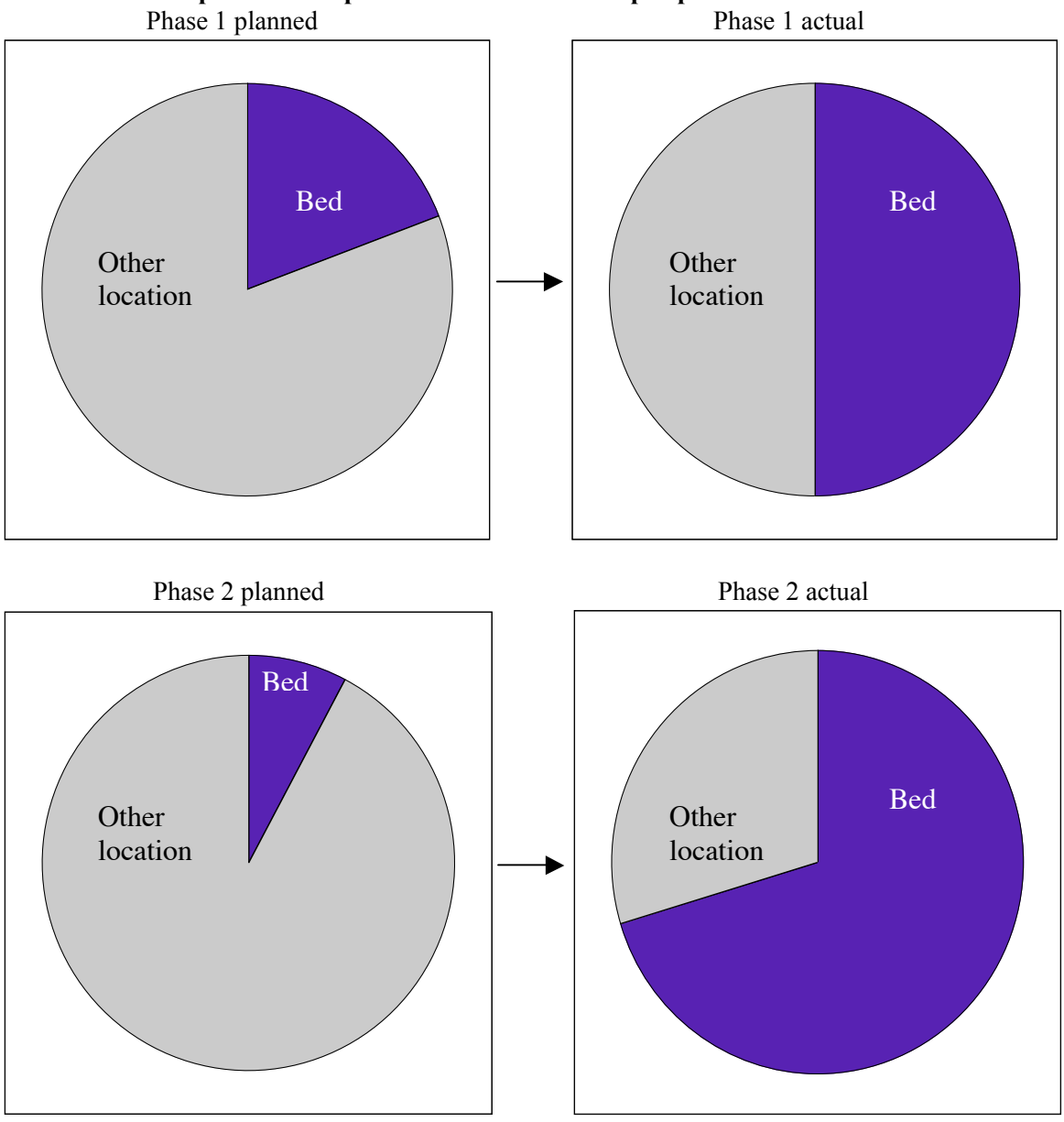
[1] Structure/routine was mentioned by 7 Phase 2 participants during the six month follow up, 4 of whom specifically discussed Gina Ford methods (2003; 2006).

Home bedsharing

Intent versus actual

More participants bedshared with their infants at home over the first six months than had reported intent to do so.[1] The differences between planned and actual bedsharing (including routine or occasional) are illustrated in Graphs 8.1.

Graphs 8.1: Any home bedsharing intent as reported on the postnatal ward versus descriptions of the practice over the first six postpartum months.



[1] Bedsharing was reportedly intended by 5 of 36 Phase 1 (13.9%) and 3 of 29 Phase 2 (10.3%) women. Actual bedsharing was reported during at least one interview over the first six postpartum months by 12 of 24 Phase 1 (50%) and 33 of 47 Phase 2 (70.2%) participants. I defined routine bedsharing as sleeping with the baby in bed for at least a portion of most nights. The differential sample sizes between those for whom intent and practice were assessed were due to follow up data obtained for more participants than who were interviewed on the postnatal ward because some women were discharged before the evening of Day 1. Additionally, infant sleep location data were not obtained in all telephone interviews.

The type of postnatal ward cot that participants were randomly allocated was not associated with differential rates of reported home bedsharing.[1]

Habitual versus occasional parent-infant bedsharing

Mothers reported routine bedsharing as being less common than occasional bedsharing.[2] Routine bedsharers described usually starting their nights with the infant in the adult bed. This was in contrast to bringing the babies into bed after the infants' first night waking, which occurred more with those who only bedshared occasionally.[3] Additionally, some mothers said that they bedshared with their infants for daytime naps only.

Maternal explanations for infant bedsharing

Increasing maternal sleep and breastfeeding facilitation predominated participants' spontaneously offered explanations for bedsharing:[4]

> "He refused to go to sleep in the moses basket. I bedshare so that I can get a better night's sleep. He sleeps better when is with me and it's easier for me to [breast]feed."
>
> Ph. 2 Part. 74. She had the standalone cot on the postnatal ward and said it was "difficult because need to get milk established so need to put [baby] on [the breast] all of the time."

Bedsharing was a practice that women described as something that "naturally happened," but not all of them expressed content with the arrangement. Having the baby in the adult bed was mentioned by a few as a bad habit or potentially hazardous:

> "She's getting too attached so I'm trying to stop" [bedsharing at two weeks].
>
> Phase 1 Part. 19. She breastfed for four weeks, none of which were exclusive. On the postnatal ward, she planned to breastfeed for as long as possible, till about six months."

> "Does" [bedshare at three weeks]. "We both tend to fall asleep after a feed. It [bedsharing] sort of naturally happened. Also in the night she cries more…but she knows when she's next to me and stops crying."
>
> [At seven weeks] "I was bedsharing quite frequently. It wasn't a problem for me but I woke up once quite confused about where I was and where she was. I moved her into a cot in own room with a baby monitor. I have guilt that she's not in the room with us but I know it's for the best."
>
> [At 20 weeks] "Yes, I bedshare when my baby is poorly."
>
> Phase 2 Part. 55. She was breastfeeding at six months.

Among the participants who reported not bedsharing at any point throughout their infants' first six months, the 'rightful' place of infants was spontaneously offered by some as the reason. Some of these mothers discussed that bedsharing "wouldn't teach them [children] any good lessons" although "it's the only way [for new parents] to get sleep."

---

[1] Bedsharing at any point over the first six postpartum months was reported by 17 of 28 side-car crib (60.7%) and 16 of 19 standalone cot (84.2%), $x^2 = 0.0839$ $df = 1$ p = 0.7721.

[2] Routine bedsharing was reported by 3 of 12 Phase 1 (25%) and 23 of 33 Phase 2 (69.7%) women who bedshared at some point over the six month period.

[3] Routine bedsharers started with the infant in bed in 2 of 3 Phase 1 (66.7%) and 12 of 23 Phase 2 (52.2%) cases.

[4] Bedsharing was reported as increasing maternal sleep by 6 of 12 Phase 1 (50%) and 15 of 28 (53.6%) Phase 2 women. Bedsharing was reported as facilitating breastfeeding in 3 of 12 Phase 1 (25%) and 3 of 28 Phase 2 (10.7%) cases.

Breastfeeding duration[1]

The duration of any breastfeeding

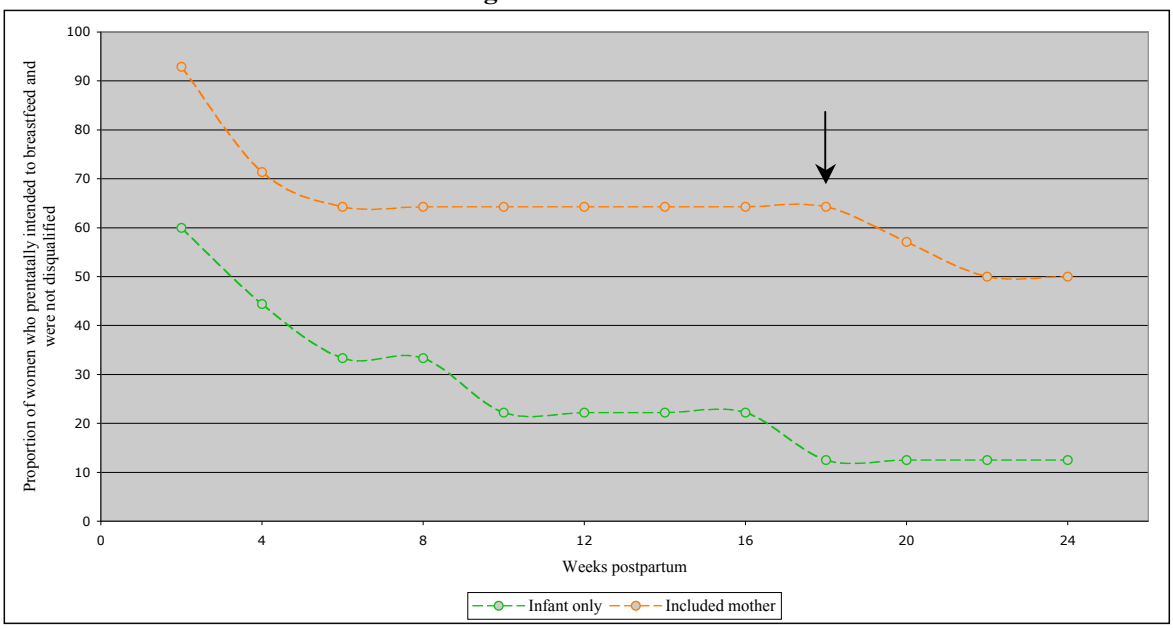
Breastfeeding duration data for Phase 1 participants are presented in Graph 8.2.

Analysis of breastfeeding duration by the type of caesarean section delivery undergone was not possible due to the combination of the small sample size, which was 24 in total, and the uneven distribution of the sub-samples (6 scheduled and 18 unscheduled).

The Phase 1 sample by reported reasons for breastfeeding intent, although still small, was more equally distributed: 10 infant-only and 14 included a benefit for the mother.

There were a greater proportion of participants who included a maternal benefit for their breastfeeding intent breastfeeding, at every postpartum measure, compared to those who cited only infant-based reasons. The difference was significant at eighteen weeks, p = 0.0263 (Fisher's Exact test).[2]

Graph 8.2: Duration of any breastfeeding among Phase 1 participants by maternal report of the reasons for breastfeeding intent.



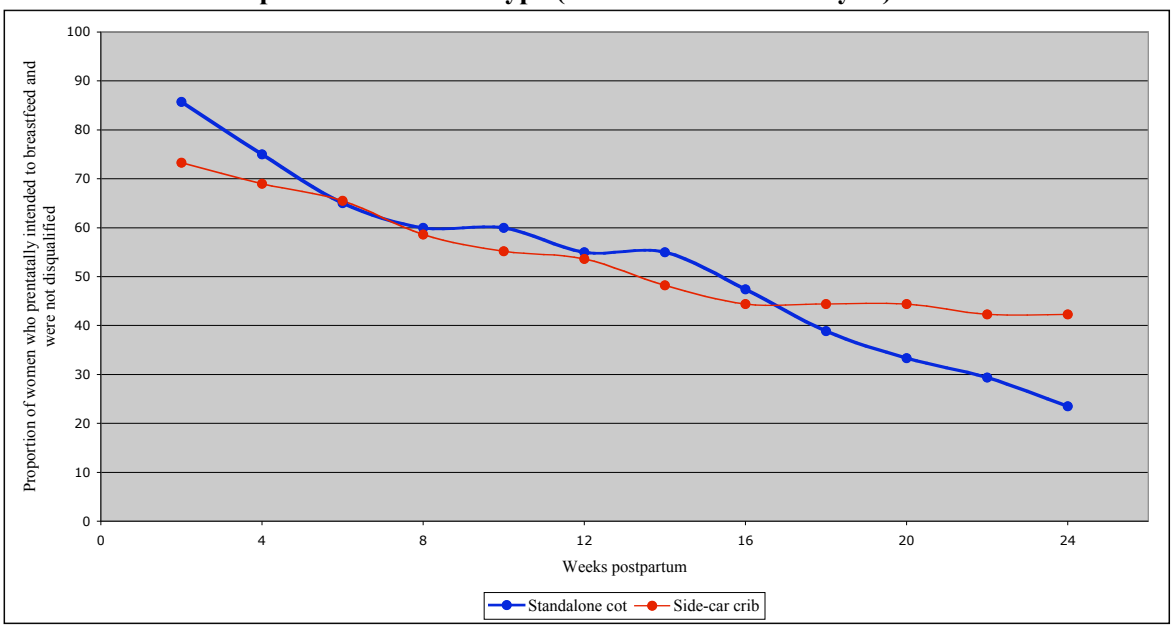
The data points for the breastfeeding duration presented in this graph and the following ones in this chapter are provided in Appendix G on pages 277-280.

[1] Breastfeeding data is out of those who intended to breastfeed and for whom longitudinal data were obtained.

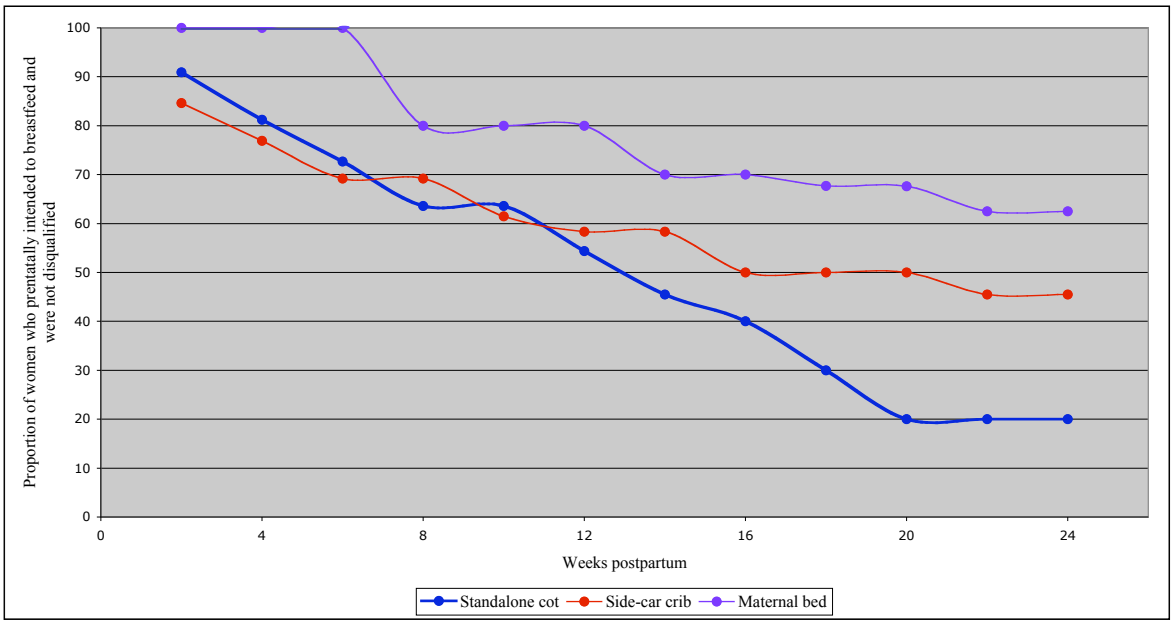
[2] I did not have *a priori* hypotheses about the specific weeks in which breastfeeding duration would vary by the sub-samples. The data presented in this chapter is exploratory into whether the type of caesarean section delivery, postnatal ward cot type, reported reasons for breastfeeding intent or home infant sleep location are issues for further investigation. If I were to present robust inferential statistics, I would apply the Bonferroni correction (Bland, 2000).

The duration of breastfeeding for Phase 2 participants are presented in Graphs 8.3-8.5. The timing of breastfeeding termination was not associated with the randomly allocated postnatal ward cot type, the postnatal ward cot type used or the reported reasons for breastfeeding intent.

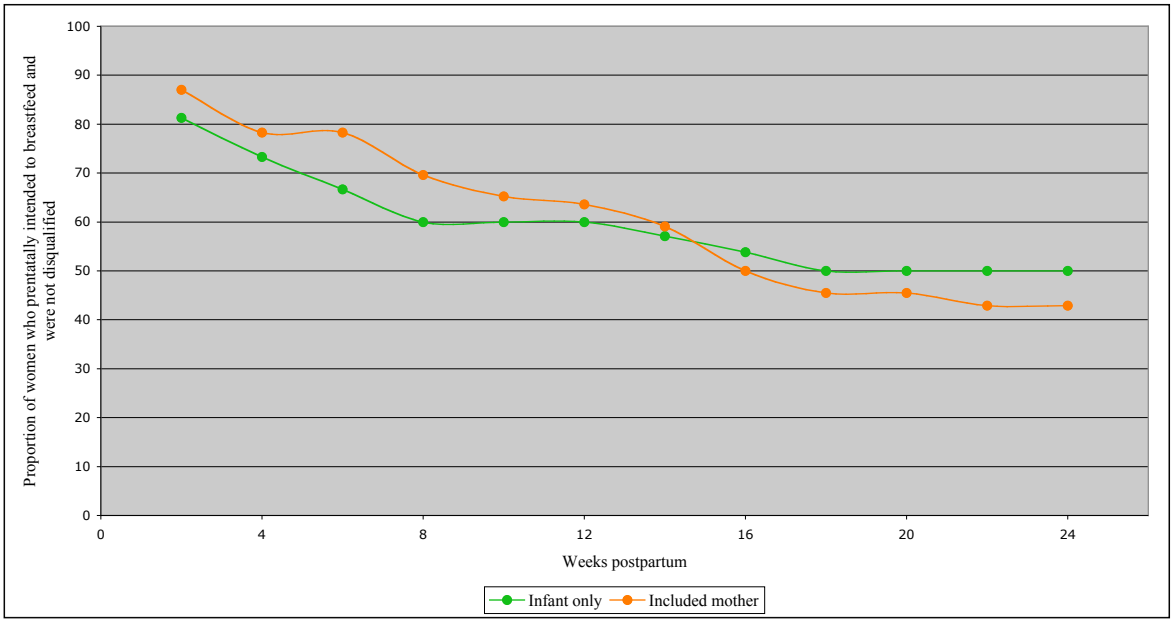
Graph 8.3: Duration of any breastfeeding among Phase 2 participants by the randomly allocated postnatal ward cot type (intention-to-treat analysis).



Graph 8.4: Duration of any breastfeeding among Phase 2 participants by the postnatal ward infant sleep location primarily used (on-treatment analysis).



Graph 8.5: Duration of any breastfeeding among Phase 2 participants by maternal report of the reasons for breastfeeding intent.



The duration of exclusive breastfeeding

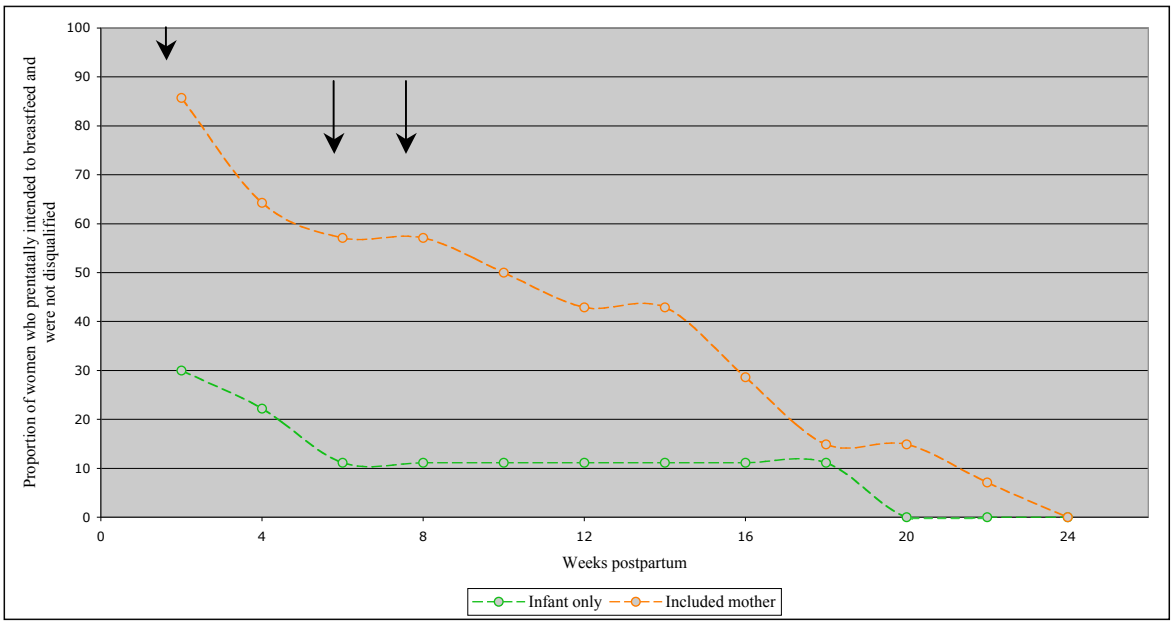
The duration of breastfeeding exclusive of water, formula or solid food supplementation among Phase 1 participants is illustrated in Graph 8.6.[1] Data were not adequate to explore breastfeeding duration by the type of caesarean section delivery undergone.

Women whose breastfeeding intent included self-advantages were more likely to be exclusively breastfeeding than those who reported infant-only reasons at:

- two weeks, p = 0.0088
- six weeks, p = 0.0355
- eight weeks, p = 0.0355

These p-values were calculated using Fisher's Exact test.

Graph 8.6: Duration of exclusive breastfeeding among Phase 1 participants by maternal report of the reasons for breastfeeding intent.



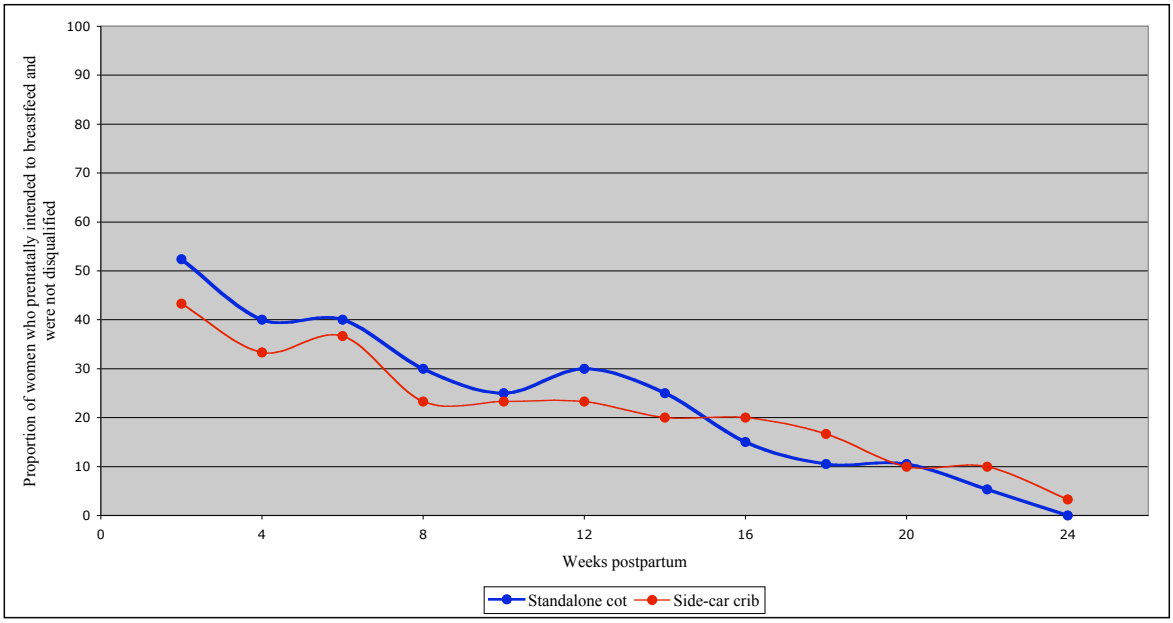
The duration of exclusive breastfeeding for Phase 2 participants is presented in Graphs 8.7 – 8.9.[2] Breastfeeding exclusivity at home over the first six months was not associated with the randomly allocated postnatal ward cot type. However, more of the Phase 2 participants who bedshared on the postnatal ward were exclusively breastfeeding at sixteen weeks compared to those who had primarily used the standalone cot as the infant sleep location, p = 0.0351 (Fisher's Exact test).

The reported reasons for breastfeeding intent were not associated with differential exclusive breastfeeding in Phase 2 over the first six months.

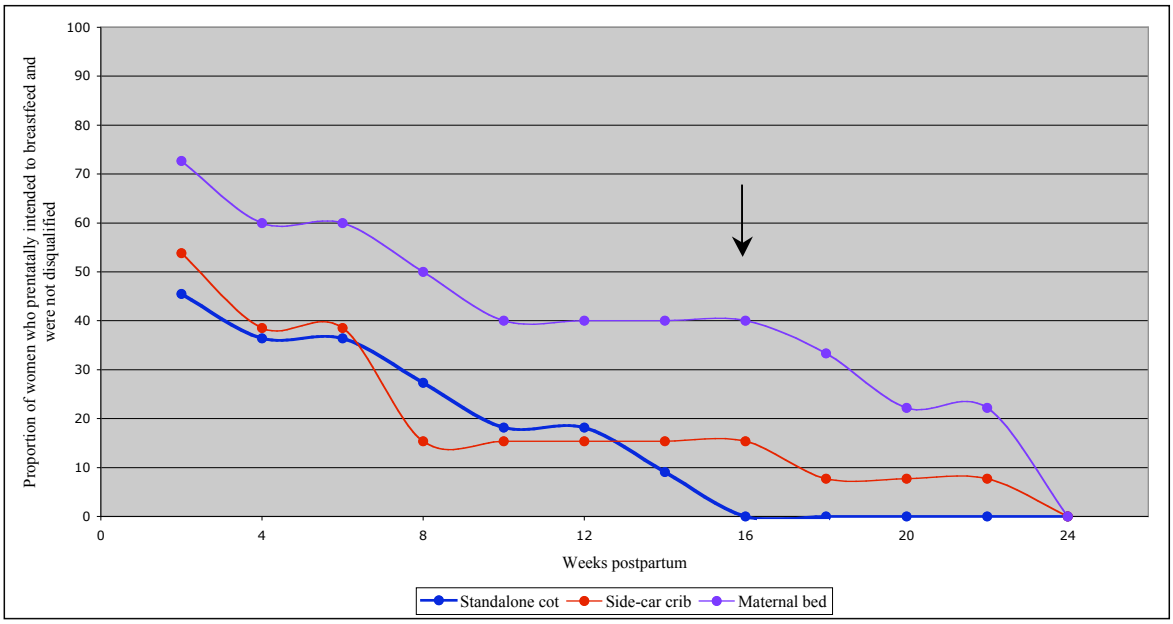
[1] Exclusive breastfeeding was determined by the weeks in which the infants received anything other than breast milk. One Phase 1 participant supplemented her baby's diet with formula for a period and then returned to exclusive breastfeeding.

[2] Three Phase 2 participants supplemented their infants' diets with formula for a period then exclusively breastfeed during subsequent weeks.

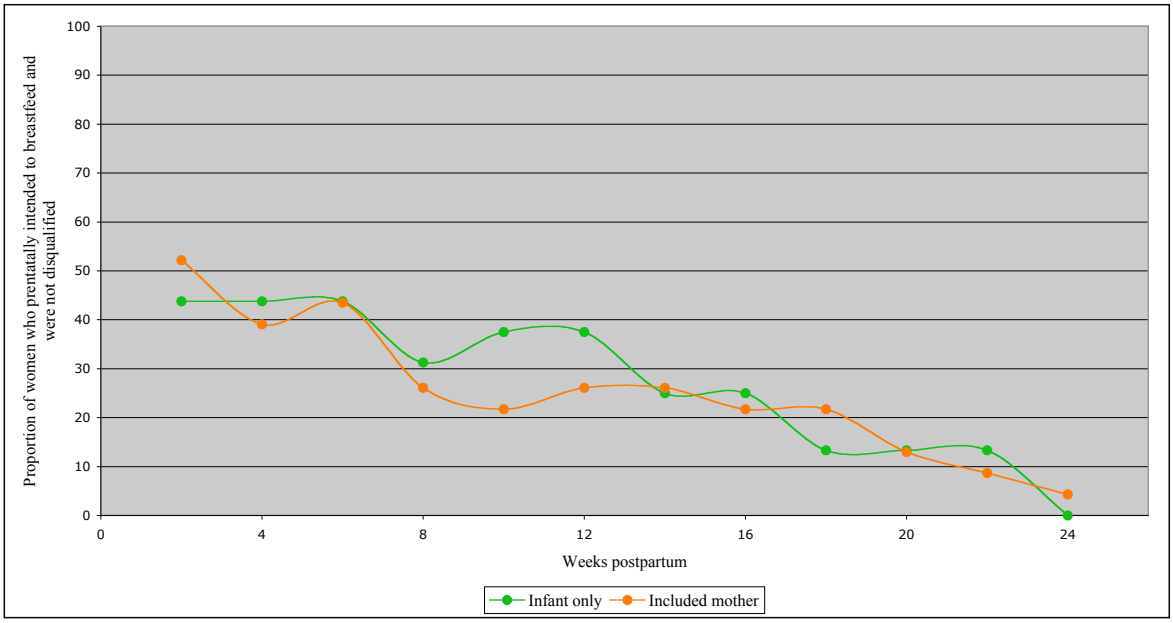
Graph 8.7: Duration of exclusive breastfeeding among Phase 2 participants by the randomly allocated postnatal ward cot type (intention-to-treat analysis).



Graph 8.8: Duration of exclusive breastfeeding among Phase 2 participants by the postnatal ward infant sleep location primarily used (on-treatment analysis).



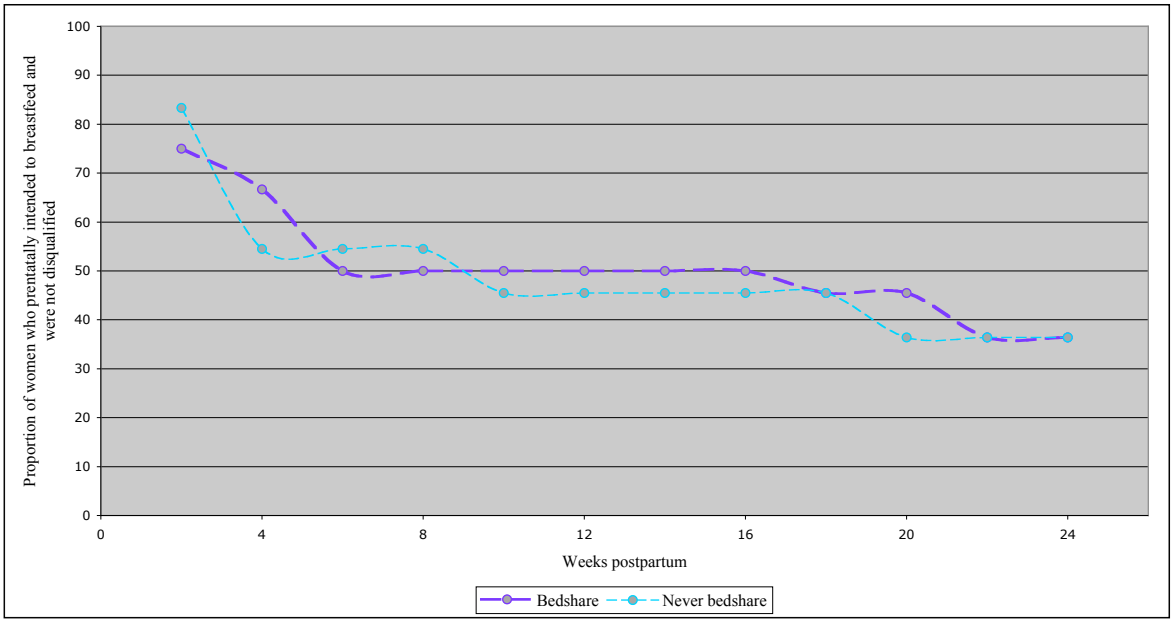
Graph 8.9: Duration of exclusive breastfeeding among Phase 2 participants by maternal report of the reasons for breastfeeding intent.



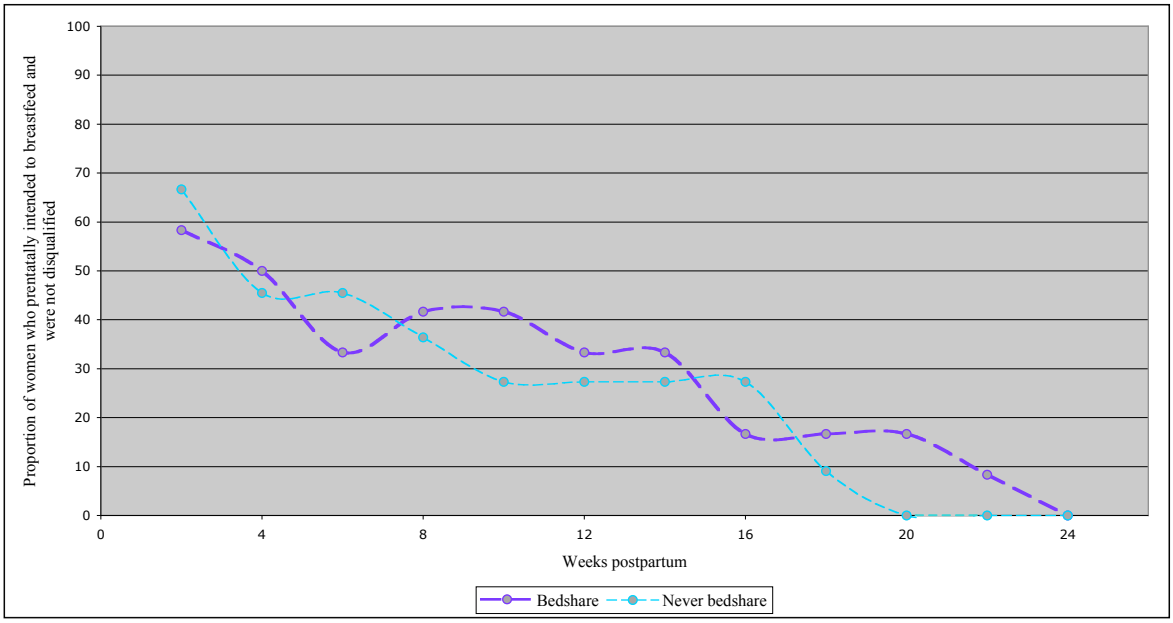
Breastfeeding duration in relation to bedsharing

The 12 of 24 Phase 1 participants who reported any bedsharing in the six months did not breastfeed differently than those whose infants never bedshared. Graph 8.10 shows bedsharing relationship by any breastfeeding and Graph 8.11 illustrates any bedsharing over the six months with exclusive breastfeeding at each week.

Graph 8.10: Duration of any breastfeeding among Phase 1 participants by any reported home bedsharing over the first six months.

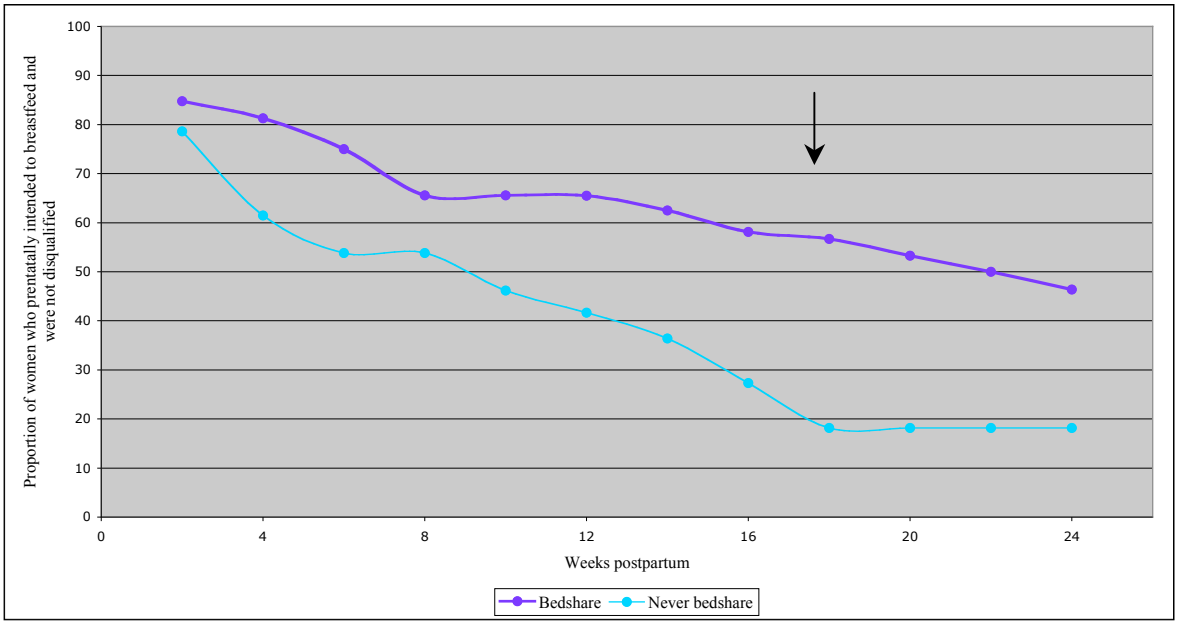


Graph 8.11: Duration of exclusive breastfeeding among Phase 1 participants by any reported home bedsharing over the first six months.

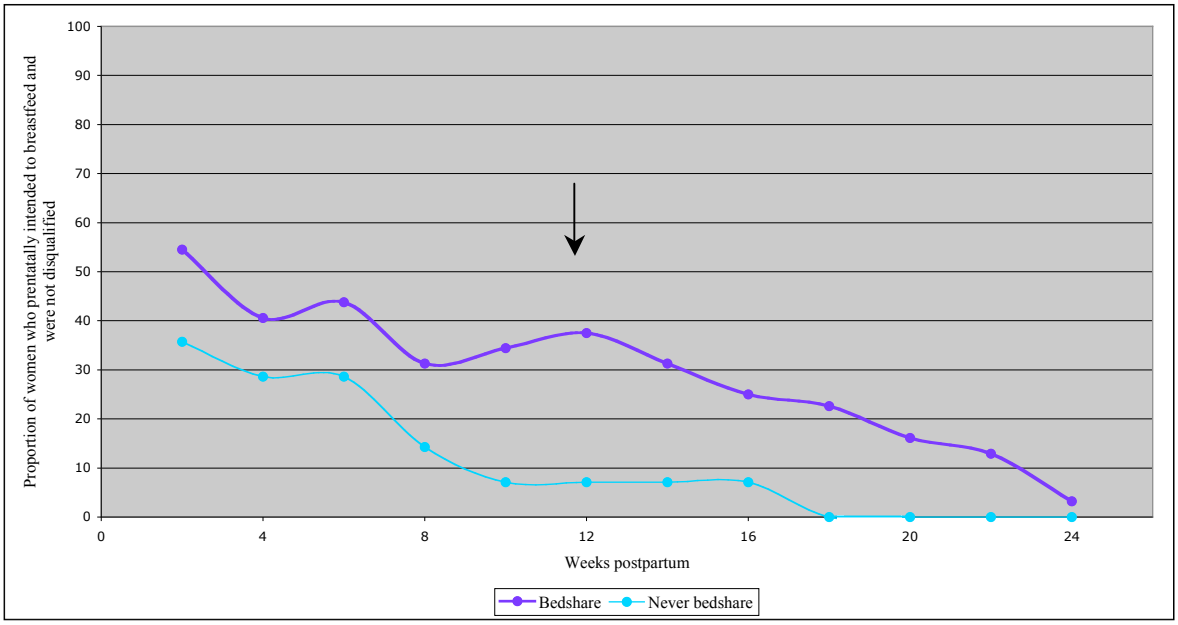


Phase 2 mothers who reported any home bedsharing were associated with any breastfeeding at eighteen weeks postpartum, p = 0.0310 (Fisher's Exact test) and at twelve weeks postpartum for exclusive breastfeeding, p = 0.0345 (Fisher's Exact test). Graphs 8.12 and 8.13 illustrate the duration of any and exclusive breastfeeding by reported bedsharing.

Graph 8.12: Duration of any breastfeeding among Phase 2 participants by any reported home bedsharing over the first six months.



Graph 8.13: Duration of exclusive breastfeeding among Phase 2 participants by any reported home bedsharing over the first six months.



Results summary

Termination of breastfeeding while in the hospital was positively associated with women who reported infant-only benefits for their breastfeeding intent in Phase 1. This relationship between stated breastfeeding reasons and the switch to exclusive formula feeding while in the hospital was not found in Phase 2.

About half of the women described being uncertain about how long they would continue breastfeeding when on the postnatal ward. Plans were dependent on infant weight gain, infant satiation, sufficient milk production and just "seeing how it goes."

The proportion of women reporting any breastfeeding, out of those who intended to, was almost 80% in both phases at two weeks and 36.6% and 31.7% at six months. The proportion of women exclusively breastfeeding was 62.5% and 47.1% at two weeks and only one participant between both phases was exclusively breastfeeding at six months.

Phase 1 breastfeeding duration by the type of caesarean section delivery could not be calculated because of an imbalance between the groups within the overall small sample. Due to the reported reasons for breastfeeding intent emerging as being associated with maternal reports of breastfeeding frequency and early breastfeeding termination, I explored breastfeeding duration by the sub-samples of 'infant-only' and 'included mother.' More women who reported breastfeeding intent that included self-advantages were breastfeeding at eighteen weeks (any) and at two, six and eight weeks postpartum (exclusive) compared to those who reported infant-only reasons.

Neither overall breastfeeding duration nor exclusivity was associated with the randomly allocated postnatal ward cot type. Despite small sub-samples, there were a greater proportion of participants who had primarily bedshared on the postnatal ward exclusively breastfeeding at sixteen weeks compared to those who had mostly used the standalone cot as the infant sleep location.

Tiredness featured in justification for formula supplementation and/or was a reason for maternal frustration in the six-month period. Imposed structure on infant feeding and sleep routines was brought up by some participants to curb the infant 'disruption.' Sporadic formula supplementation was a method to alleviate maternal "exhaustion," with some subsequently returning to exclusive breastfeeding.

The few participants who had their infants sleep in a separate room when first coming home explained that this arrangement was due to either it simply being a possibility or it was an attempt to minimise parental sleep disturbance. Reasons for bedsharing intent included concern for infant health, desire for closeness and cultural norms. Bedsharing was reported among many more participants than who had said they intended to do so. It was something women described as "naturally happening" to facilitate sleep and/or breastfeeding.

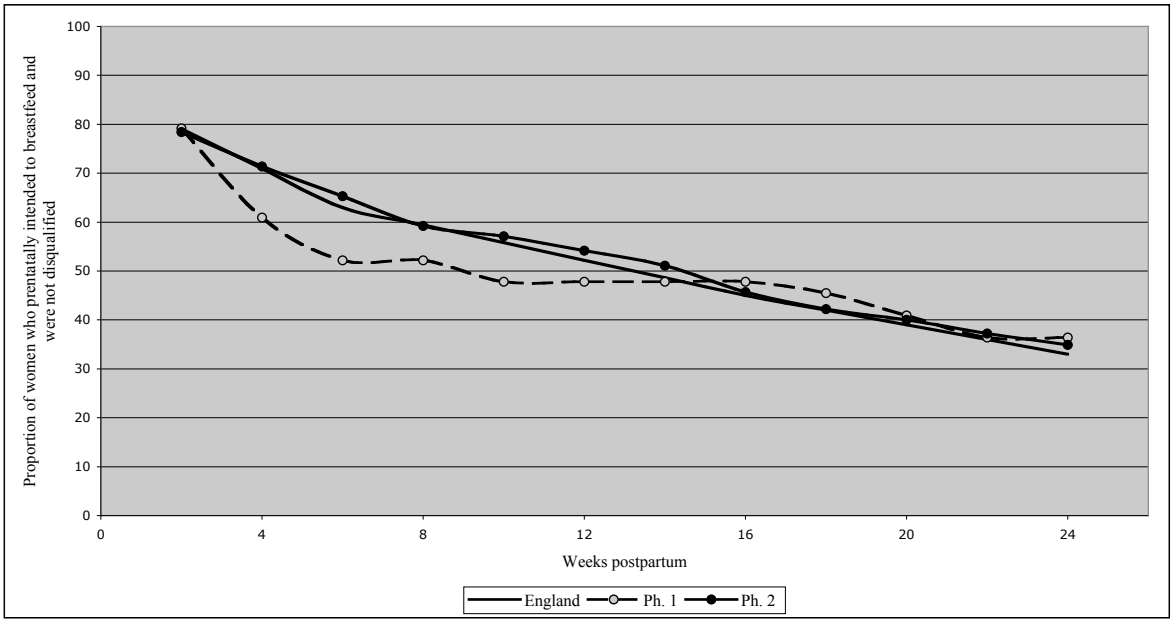
Having reported any bedsharing was positively associated the duration of any breastfeeding at 18 weeks and for exclusivity at twelve weeks. The arrangement, which was mostly experienced only occasionally, caused upset among a few mothers who were concerned about the 'rightful' place of infants or for the babies' safety.

Discussion

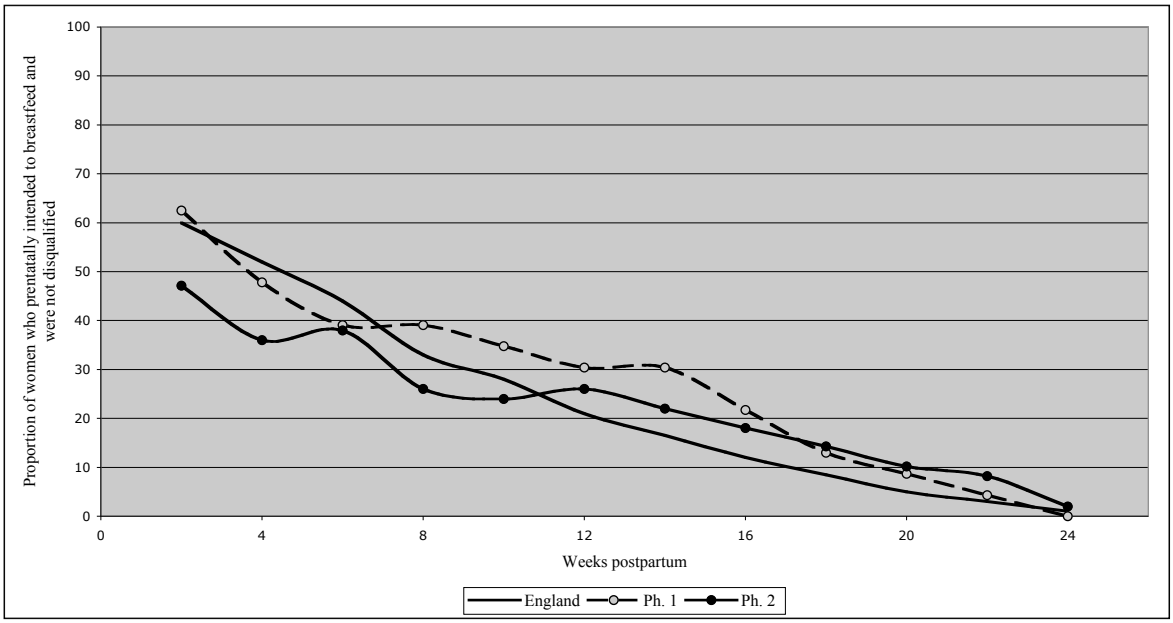
Breastfeeding duration compared to national statistics

The breastfeeding duration data in both phases were similar to the pattern of any and exclusive breastfeeding in England. Graphs 8.14 and 8.15 compare the rates.[1]

Graph 8.14: The duration of any breastfeeding compared to all women who initiated breastfeeding in England during 2005.



Graph 8.15: The duration of exclusive breastfeeding compared to all women who initiated breastfeeding in England during 2005.



It is important to note that my findings were based on a different definition to the Infant Feeding Survey. Bolling and colleagues (2007) calculated breastfeeding duration among those who initially breastfed, not by all who prenatally intended to do so.[2] However, this

[1] For the purpose of comparison with the national breastfeeding rate, I grouped together the Phase 2 breastfeeding duration data because there were not significant differences between those allocated side-car crib or standalone cot (refer to p. 171 and p. 173).

[2] In England during 2005, 95% of mothers who initiated breastfeeding continued through postpartum Day 1, 92% were breastfeeding on Day 2 and the rate of breastfeeding continuation was down to 89% on Day 3 (Bolling et al., 2007).

variation was not a major concern for my small-scale comparison, since few of my participants switched to formula without initiating breastfeeding. This does raise the issue of the importance of clearly explaining researched topics to enable appropriate comparison of results.[1] Additionally, I recommend inclusion of all women who prenatally considered breastfeeding when documenting duration rates to best identify areas for better support. Dyson and her co-authors (2006) identify this lack of recorded breastfeeding intent as a major methodological weakness in primary research. Breastfeeding intent could be documented at the final ultrasound scan or other antenatal hospital appointments near term. This approach would provide accurate records after having provided the potential for infant feeding discussion between the woman and her midwife/physician throughout pregnancy. If a woman is asked her breastfeeding intent early in pregnancy, this could give an inaccurate representation of her plans nearer to delivery and/or eliminate the provision of further breastfeeding information.

Indefinite breastfeeding plans

Most participants planned to continue breastfeeding after leaving the postnatal ward, although the majority expressed indefinite plans that were contingent on infant weight gain, satiation, producing enough milk and "seeing how it goes." These reasons mirrored the most common factors reported by mothers in England for stopping breastfeeding with the first week postpartum: baby not feeding properly, having insufficient milk and painful breast (Bolling et al., 2007). The indefinite plans may be a reflection of women's concerns about the adequacy of breast milk, their ability to lactate and negotiation the of the breastfeeding process, as discussed in Chapter 6. Thulier and Mercer (2009) reviewed the variables associated with breastfeeding duration. Their report of the interrelated influences:

- biological, perception of insufficient milk supply, infant health problems, maternal obesity, the physical challenges of breastfeeding, maternal smoking, parity and mode of delivery;
- social, paid work, family support and professional support
- psychological, maternal intention, interest and confidence in breastfeeding

are consistent with the aspects of confident commitment described by Declercq and co-researchers (2009).

There is much literature on the behavioural and physiological influences of breast milk supply; the vast majority of infant weight and milk production issues are due to relatively infrequent breastfeeding instead of a biological deficiency (Amir, 2006; Wambach et al., 2005). The degree to which women recognise this, however, is unknown (Dykes, 2002; Amir, 2006). Prenatal education and postpartum support should provide clear, physiology-based, guidance on the importance of frequent breastfeeding. Participant responses suggest that some women are confused and upset by their lack of understanding of both infant satiation and sleep behaviour.

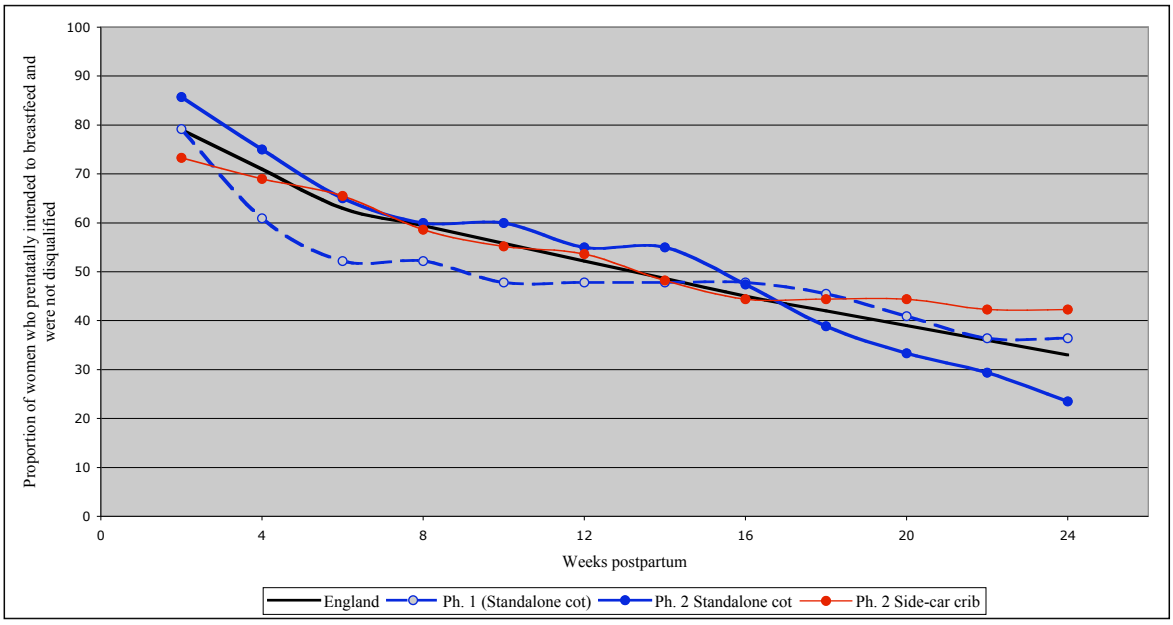
The duration of breastfeeding involves complex interaction of the above-mentioned variables, but data suggest that hospital adherence to several of the Baby Friendly Ten Steps is associated with increased breastfeeding initiation and continuation (Chalmers et al., 2009). Murray, Ricketts and Dellaport (2007) found that although a small percentage of 2,172 mothers in Colorado experienced the full list of Baby-Friendly hospital practices, those who did were significantly associated with continued breastfeeding at 16 weeks postpartum, $p < 0.001$. The literature and statements among my participants suggest that breastfeeding influences compound one another, leading to network of support or a cycle of difficulty.

[1] For example, see Blair and colleagues (2001) or Côté (2006) for different parent-infant bedsharing definitions.

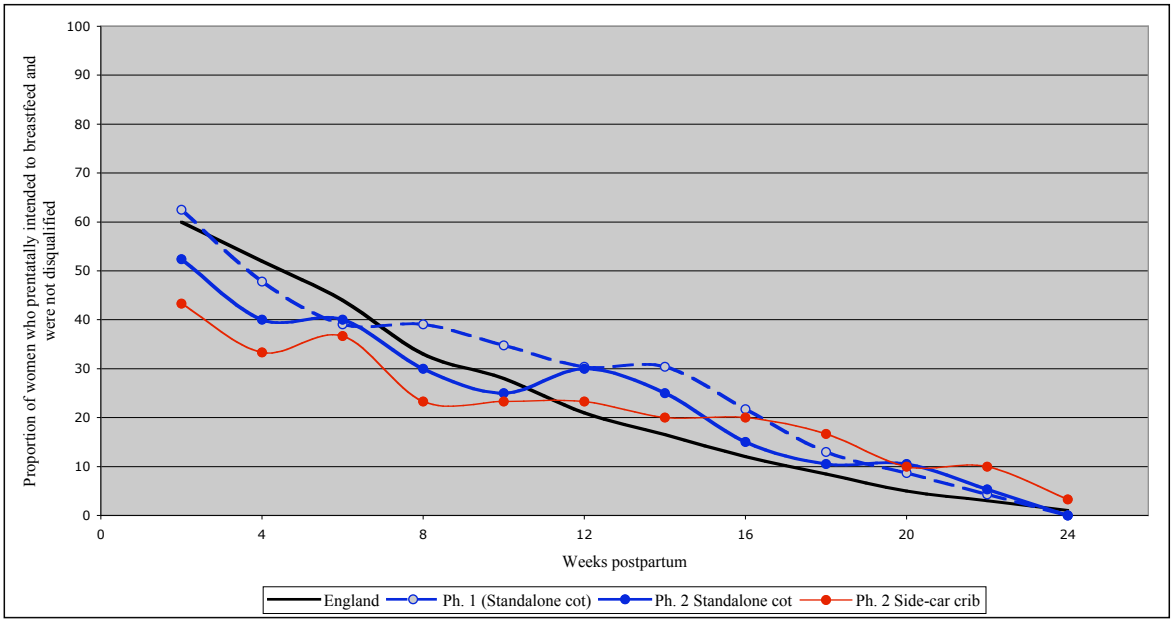
No association between breastfeeding duration and the postnatal ward cot type

This study was not powered to detect differences in breastfeeding initiation or duration by the postnatal ward cot type. Exploratory analysis did not support an effect. Graphs 8.16 and 8.17 illustrate that the recorded breastfeeding duration by the postnatal ward cot type did not differ from the English trends.

Graph 8.16: Duration of any breastfeeding by the randomly allocated postnatal ward cot type compared to all women who initiated breastfeeding in England during 2005.



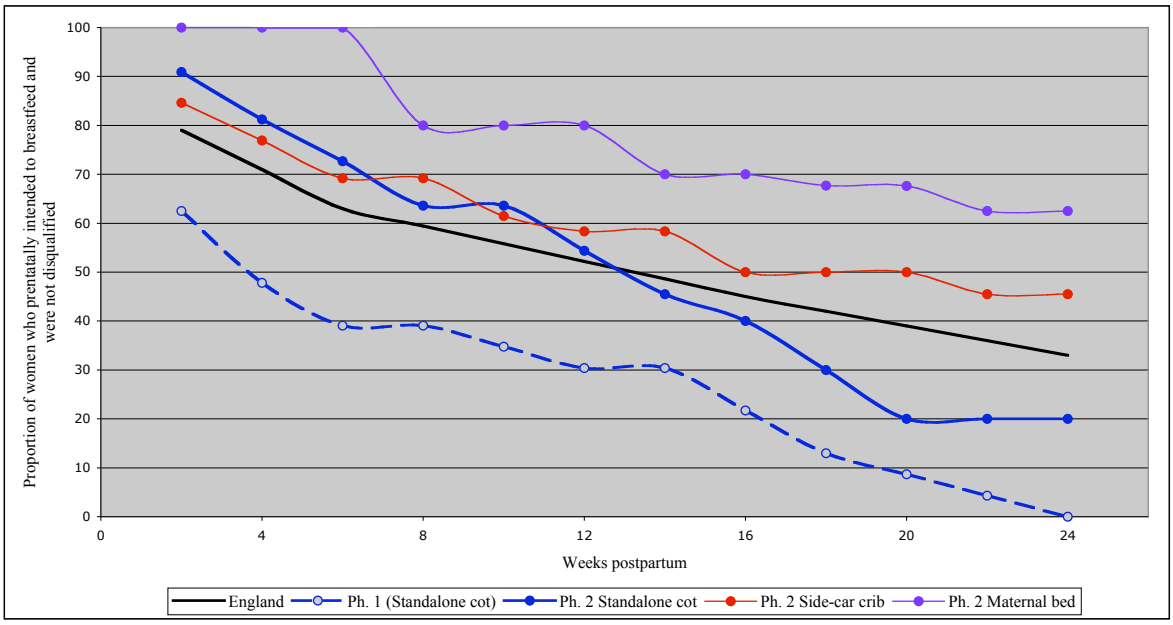
Graph 8.17: The duration of exclusive breastfeeding by the randomly allocated postnatal ward cot type compared to all women who initiated breastfeeding in England during 2005.



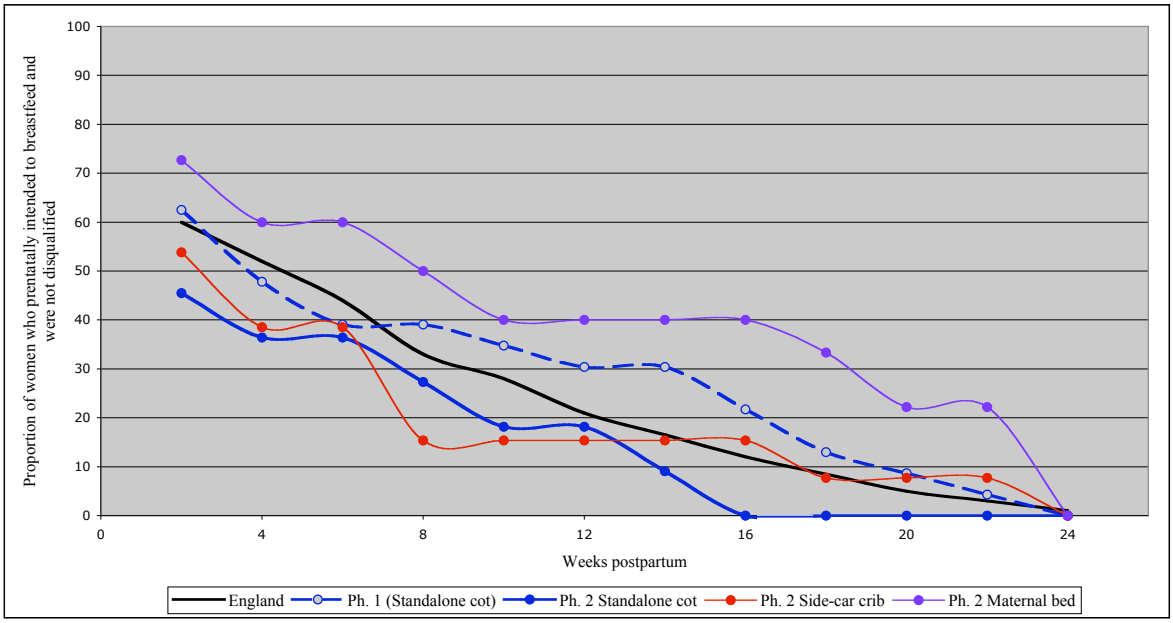
The ongoing NECOT trial by Ball and colleagues (refer to p. 51) aims to test whether the random allocation of the postnatal ward side-car crib or standalone cot impacts breastfeeding duration over the course of the first six postpartum months. The sample comprises 1,100 mothers and their singleton newborns (by any birth mode) from the Royal Victoria Infirmary. Data collection is being conducted from January 2008 to March 2010.

Further research into mother-infant access while rooming-in after a caesarean section is warranted by the possible association of postnatal ward bedsharing on rates of breastfeeding continuation, shown in Graphs 8.18 and 8.19.

Graph 8.18: Duration of any breastfeeding by postnatal ward infant sleep location primarily used compared to all women who initiated breastfeeding in England during 2005.



Graph 8.19: Duration of exclusive breastfeeding by postnatal ward infant sleep location primarily used compared to all women who initiated breastfeeding in England during 2005.



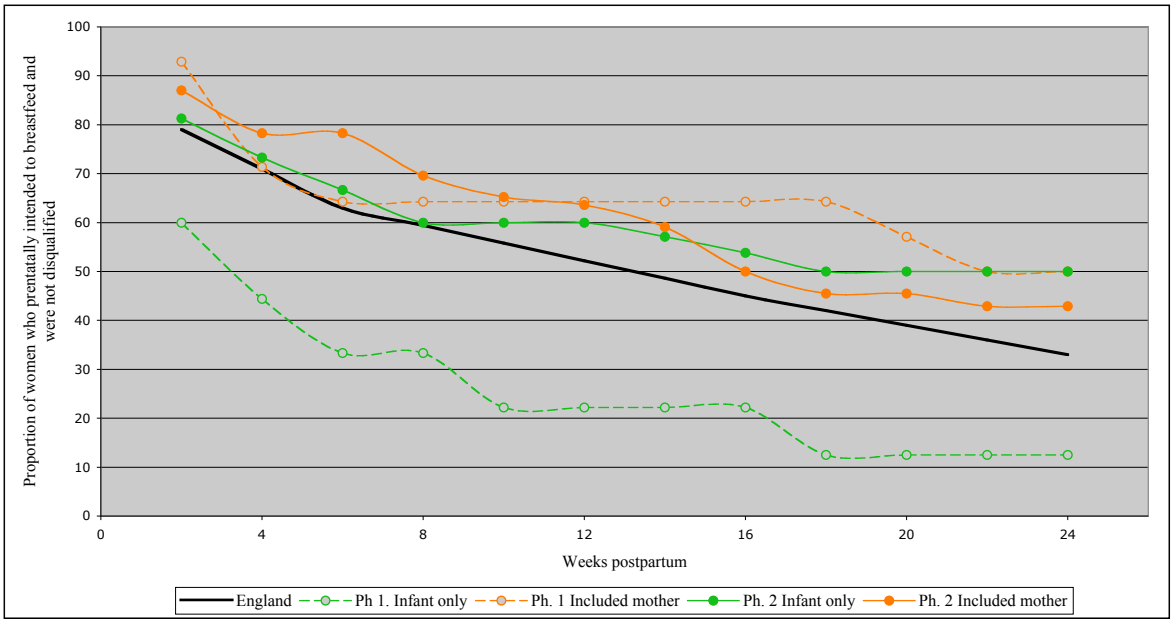
The NECOT study will provide intention-to-treat analysis of the impact of the side-car crib allocation on breastfeeding duration compared to those who receive the standalone cot, but the study is not collecting data on the compliance with the cot types while women are in the hospital. Video documentation of postnatal ward mother-infant interactions is costly and time-consuming, but it provides insight into the mechanisms by which differential breastfeeding outcomes derive in these experimental conditions. The characteristics of women who bedshare on the postnatal ward despite being provided with an infant cot may be associated with their mobility (as discussed in Chapter 7). The frequent breastfeeding

that I found and the number per hour documented by Ball and colleagues (2006) among bedsharers on the postnatal ward may facilitate prolactin receptors in the breast tissue (refer to p. 27), which could be associated with increased perceived and/or actual copious breast milk supply over the postpartum months.

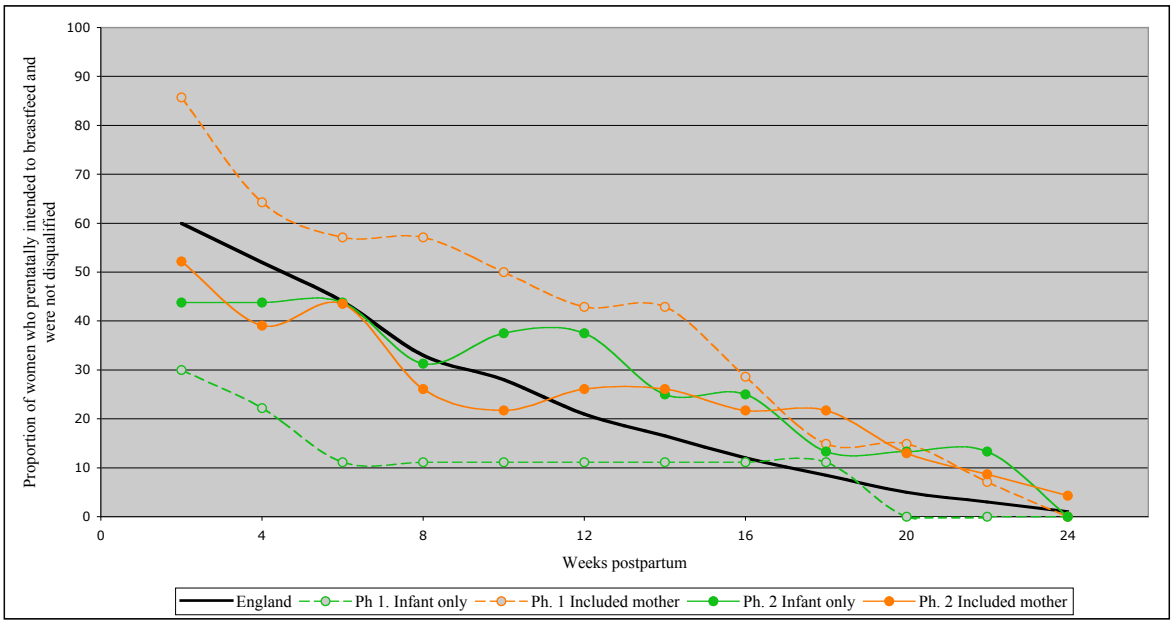
Maternal perception of breastfeeding and reported duration

Importantly, some of my data suggest that breastfeeding duration may be maintained by the maternal commitment associated with the perceived cost and benefit. Graphs 8.20 and 8.21 show that breastfeeding duration among the Phase 1 participants who reported maternal reasons for breastfeeding intent was greater than for mothers in England as a whole.

Graph 8.20: The duration of any breastfeeding by reported reasons for breastfeeding compared to women who initiated breastfeeding in England during 2005.



Graph 8.21: The duration of exclusive breastfeeding by reported reasons for breastfeeding compared to women who initiated breastfeeding in England during 2005.



The relationship between reported reasons for breastfeeding and duration was not supported by Phase 2 data. This might have been complicated by the additional variable of the

randomly allocated postnatal ward cot type. As discussed in Chapter 6, maternal confident commitment was identified by Declercq and colleagues (2009) as being important for breastfeeding realisation. My data suggest that greater maternal willingness to learn and maintain the process of breastfeeding may be motivated by awareness of the mutual mother-infant health benefits.

Coping with maternal tiredness

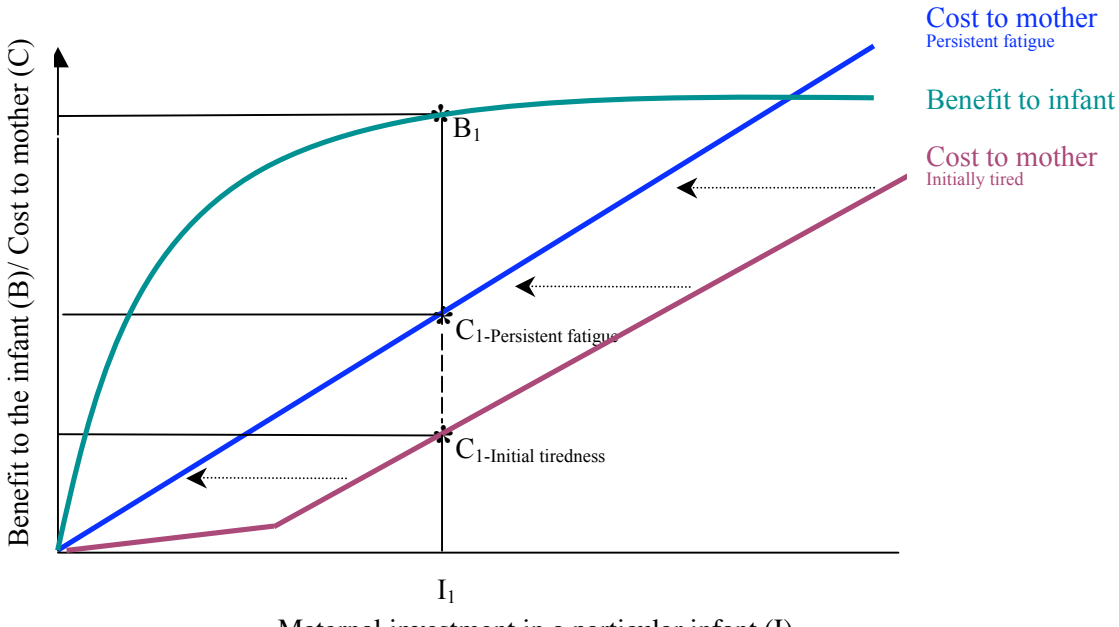
Breastfeeding taking a long time and/or being tiring was one of the most common reasons UK women ceased breastfeeding within two weeks postpartum (Bolling et al., 2007). Additionally, mothers in the northeast of England who initiated breastfeeding but discontinued before four months (n = 208) spontaneously reported this was most often due to 'too frequent' feeding (Wright, Parkinson, and Scott, 2006). Fatigue due to mothers being the only ones able to feed the infant was cited as a disadvantage to breastfeeding in Chapter 4 and a challenge for postnatal ward frequency in Chapter 6.

The impact of maternal tiredness on home breastfeeding after a caesarean section is an example of "imperfect replenishment" of parental resources that heightens parent-offspring conflict over time (Trivers, 1974: 254). Trivers discussed that the cost of such depletion can incrementally rise, even as parental investment decreases. When mothers do not fully recuperate after caesarean section delivery due in part to their extended recovery period, then the persistence of a breastfeeding obstacle like maternal tiredness can increase the costs of breastfeeding and accumulate to fatigue. Trivers explains that if an individual:

> is failing throughout [the period of parental investment] to replenish her energy losses, then she is constantly increasing her deficit and greater deficits may be associated with disproportionate costs [of continued offspring investment] (1974: 254).

Graph 8.22 models maternal tiredness imposing a greater cost of breastfeeding investment after a period of time.

Graph 8.22: Theoretical mother-infant health trade-offs with breastfeeding at a certain point in time when persistent maternal tiredness increases the perception and/or actual effort required.



In Graph 8.22, the dotted line highlights the difference in maternal cost, $C_{1\text{-Persistently tired}} - C_{1\text{-Initially tired}}$, at investment level I_1. Unrelenting maternal tiredness may increase both women's perception of breastfeeding challenges, through their feelings of the strain not "letting up," and their (interrelated) physical ability to invest, through diminished energy levels.

A mother's perception of opportunity to ease the burden of frequent (especially night-time) breastfeeding by supplementing the infant's diet with formula may be partially offset when continuing breastfeeding is perceived to entail benefits to her. This self-benefit can range from short- to long-term issues, such as finding breastfeeding a rewarding experience to losing weight or minimising the risk for reproductive cancers (refer to the maternal health consequences of breastfeeding pp. 2-3). The depiction of this shift in cost was presented in Graph 4.3 on page 86.

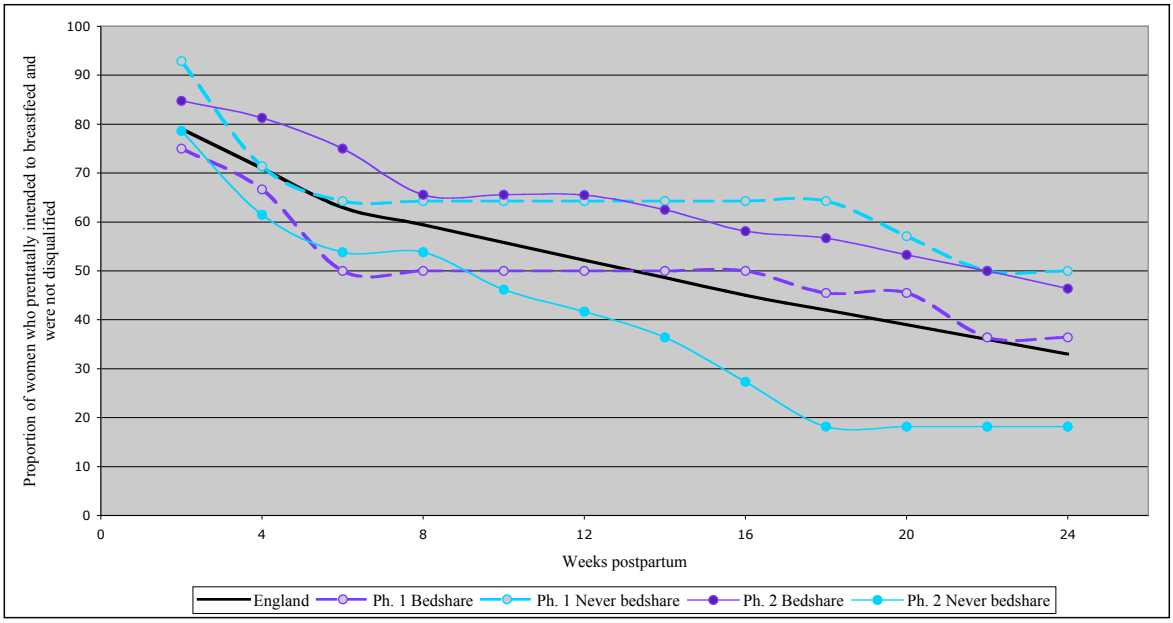
O'Brien and colleagues (2009) present a 'tool-box' of coping strategies that women employed to support their breastfeeding. Results from their two interview studies in Australia (n = 40 and n = 21) were themes of: increasing breastfeeding knowledge; staying relaxed and 'looking after yourself; the use of positive self-talk; challenging unhelpful beliefs; and problem solving. Similar themes of 'looking after me' and 'managing the load' were found by Taylor and Johnson (2008) as how women coped with postpartum fatigue. Fifty-nine Australian women (n = 27 primiparas and n = 32 multiparas) completed open-ended postal questionnaires at 6, 12 and 24 weeks postpartum. In response to Taylor and Johnson's direction to "please list the things you have been doing to decrease your fatigue since the birth of your infant," women most commonly used self-care strategies of sleeping/conserving energy instead of getting assistance or lowering their expectations of what they should be doing in terms of infant care and other activities.

'Looking after oneself' is a particularly important theme that appeared in my data as well. It was brought up as justification for formula supplementation so that the mothers could get more sleep. Participants who encountered seemingly unassailable obstacles were usually upset by deviation from their plans and later expressed the change as being best for both the infant (satiation) and themselves (rest). This is an issue that should be explicitly discussed prenatally and through postpartum support groups such as La Leche League. Familial awareness of maternal breastfeeding benefits (and understanding of their basis), can shift the cost-benefit analysis of breastfeeding in such strained circumstances and may provide incentive for others to provide more additional support for the mother. In addition to breastfeeding outcomes, maternal responsiveness to infants during the night has been associated with child attachment at one year of age (Higley and Dozier, 2009).

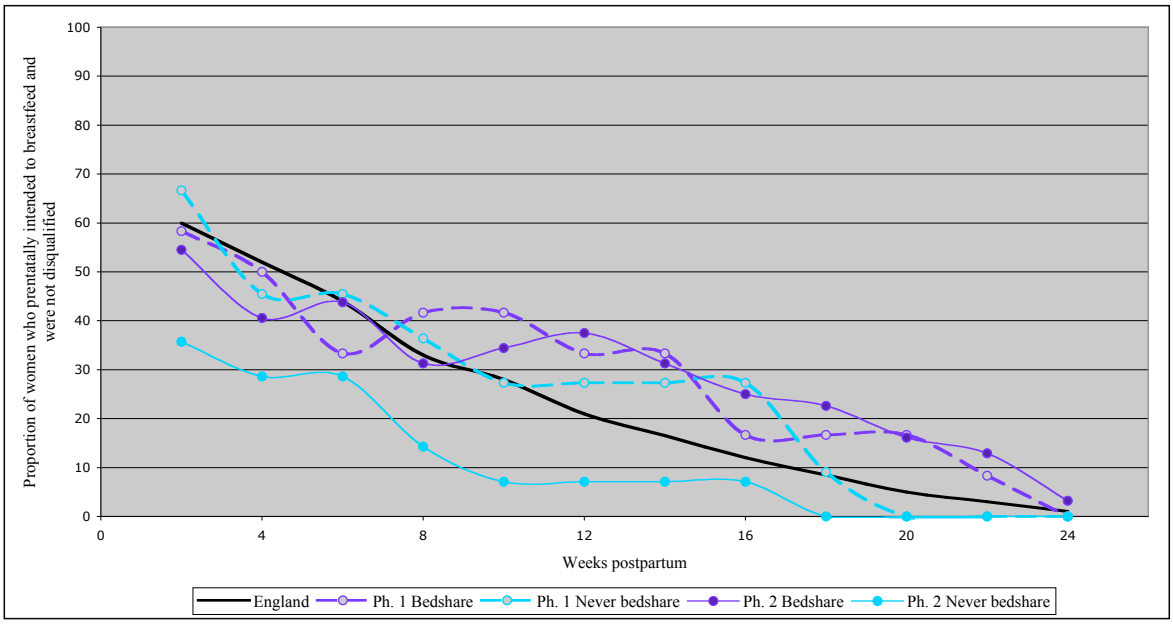
When women are strained physically and emotionally, one would expect for them to seek coping mechanisms to alleviate the effort required through frequent breastfeeding. Lack of sleep is a common concern among new parents (Declercq et al., 2008) and many end up unexpectedly bedsharing in the first few postpartum months (Ball, Hooker, and Kelly, 1999). The high proportion of unintended bedsharing, combined with maternal explanations with a focus on tiredness and ease of breastfeeding suggest minimising night-time effort as a motivator for bedsharing. Consistent with this finding is Ball's (2007) suggestion that bedsharing ameliorates the disruption between frequent night-time breastfeeding and maternal sleep.

My data, illustrated in Graphs 8.23 and 8.24, show that participants who reported any home bedsharing over the six-month period had slightly greater rates of breastfeeding than the average in England.

Graph 8.23: The duration of any breastfeeding by reported home bedsharing compared to all women who initiated breastfeeding in England during 2005.



Graph 8.24: The duration of exclusive breastfeeding by reported home bedsharing compared to all women who initiated breastfeeding in England during 2005.



Although this data does not reflect breastfeeding by the weeks in which bedsharing specifically took place, an interpretation of the findings is that the willingness to bedshare indicates it as a coping mechanism for maternal tiredness instead of switching to formula or using it in an attempt to extend infant feeding intervals. Santos and colleagues (2009) found a greater prevalence of breastfeeding when the sample of 4,231 Brazilian infants were twelve months old among those who had habitually bedshared at three months of age compared to those who had not, $p < 0.001$. McKenna and McDade (2005) portray bedsharing and breastfeeding as a mutually reinforcing system because of the behavioural (sleep maximisation), relational (maternal confidence in satiating infant and enjoyment of

closeness) and physiological benefits (prolactin surge).[1]

Bedsharing has been associated with breastfeeding (McCoy et al., 2004; Blair and Ball, 2004; Ball, 2007; Santos et al., 2009). However, there are few longitudinal studies on bedsharing. Most of the research involves retrospective data collection in a questionnaire format that is unable to document the changing nature of the arrangements. I have previously discussed the fluidity of infant sleep locations over the course of a single night (Klingaman, Volpe, and McKenna, 2005). Ball (2007) warns that the lack of understanding of what normative bedsharing means for parents can render analysis of infant risk or breastfeeding cessation in relation to sleep arrangements meaningless.

Previous studies have documented that bedsharing in England decreases as infants age (Ball, 2003; Blair and Ball, 2004; Ball, 2007). My data contribute participant explanation for this behaviour in their discussions of not 'having to' bedshare anymore once the infants slept longer in the night. If considered appropriate and practiced safely, then bedsharing can be effective in balancing maternal maintenance and infant feeding for the entirety or portions of night. The rates of reported bedsharing that I found are consistent with those of previous studies.[2] The distinction between habitual and occasional bedsharing matched the pattern in the United Kingdom,[3] which is important because it supports inclusion of specific bedsharing definitions in research studies. An unexpected finding was bedsharing exclusive to daytime naps among a few participants. Rigda, McMillen and Buckley (2000) also found that daytime bedsharing was common in the early months, which they discuss in relation to the lack of infants' circadian sleep rhythm.

The data that bedsharing is common, often unintended and occurs in many forms merits provision of bedsharing guidance to all new mothers and removing the stigma associated with discussions of infant sleep location. Reports of bedsharing should not include how often women "allowed" infants to sleep in the parental bed as in the Infant Feeding Survey (Bolling et al., 2007: 144); rather, the documentation needs to be objectively framed so that policy can reflect unbiased data. The controversy surrounding co-sleeping and bedsharing is no doubt intended to minimise harm to infants, but it often driven by Western cultural beliefs instead of the scientific method (McKenna and McDade, 2005). The Academy of Breastfeeding Medicine issued a summary of the anthropological literature, clinical issues and social critique (McCoy et al., 2008). The protocol highlights: bedsharing is a form of co-sleeping and the arrangements are experienced differently around the world; bedsharing is clinically indicated in some circumstances, such as in malaria settings, in cold conditions or when appropriate alternatives are otherwise unavailable; the data (and lack of) regarding the relationship to sudden infant death (SIDS); and the positive association between bedsharing and breastfeeding. The ABM concludes that parents should be offered impartial information so that they can make their own informed decision about night-time infant care.

The few of my participants who always had their infants sleep in a separate room at home did so against the advice of the United Kingdom Department of Health (2009). By unclear mechanisms, sleeping in the same room is associated with lower rates of sudden infant

[1] The intensity and frequency of nipple stimulation influences the release of prolactin, which triggers milk production through regulation of the lactose-synthetase system (Blackburn, 2007). This process is especially important during the night because the circadian rhythm of prolactin production (that is also found in human males and non-lactating females) persists in breastfeeding women at night (levels are higher) (Stern and Reichlin, 1990, in Rankin, 2005c).

[2] I documented the occurrence of any bedsharing over the first six postpartum months as 50% in Phase 1 and 70.2% in Phase 2. This is similar to the 73% of 66 initially breastfeeding mothers in England (Ball, 2007) and the 80% of 44 mostly breastfeeding in Austria (Rigda, McMillen, and Buckley, 2000).

3 During 2005, 48% of mothers across the United Kingdom reported bedsharing, with 37% saying rarely or sometimes and 10% routinely (Bolling et al., 2007).

death (Carpenter et al., 2004; Blair et al., 1999; Tappin, Ecob, and Brooke, 2005). McKenna and colleagues (1990; 1993; 2005; 2007) hypothesise that the sensory stimulation from the caregiver to the infant is evolutionarily expected and protective against SIDS because of infants' degree of neurological immaturity. My participants who planned to have infants in a separate room did not express awareness of the public health recommendation. A possibility is that they discarded the advice due to lack of awareness regarding basis of why night-time infant proximity 'matters.' Consistent with my recommendation for clarified information regarding infant feeding consequences, the ABM and other protocol should provide the current hypotheses for why room sharing is protective. This level of detail may promote medical professionals and families to inquire about the methodology and ultimate explanations more frequently, which could spur funding bodies to prioritise further research.

Summary

The results in this chapter indicate that maternal perception of 'normal' infant behaviour, lactation physiology, advantages of breastfeeding and the coping mechanisms that women adopt to counter strains on their needs may be important contributors to the duration of exclusive and any breastfeeding.

Direct prenatal and postnatal discussion of the trade-offs involved with home infant feeding and sleep practices may benefit families, so that they make informed decisions regarding the child's health and the mother's well being. Greater awareness of the physiological impact of breast milk and lactation over an extended period of time (especially through the first six postpartum months) may reduce the 'appeal' of manipulating the frequency of infant feeding, which can lead to a cycle of less milk production and breastfeeding. These issues are especially of concern for night-time parenting and/or in the context of maternal recovery from caesarean section delivery.

The commonness of parent-infant bedsharing, from an evolutionary perspective but also currently within England, may be of comfort to parents when they adopt the practice (occasionally or habitually). Parental decisions regarding the infant sleep location – on the continuum of separate rooms to bedsharing – could be improved with regards to safety, breastfeeding support and the adults' mental health if the information they considered were objective and individualised.

The conclusion chapter ties together the themes that emerged as affecting the balance between maternal recovery/rest and breastfeeding effort. The perceived trade-offs may be altered by greater provision of physiological information. Mothers' intentions may also be better realised through improved practical support.

Chapter 9: Conclusion

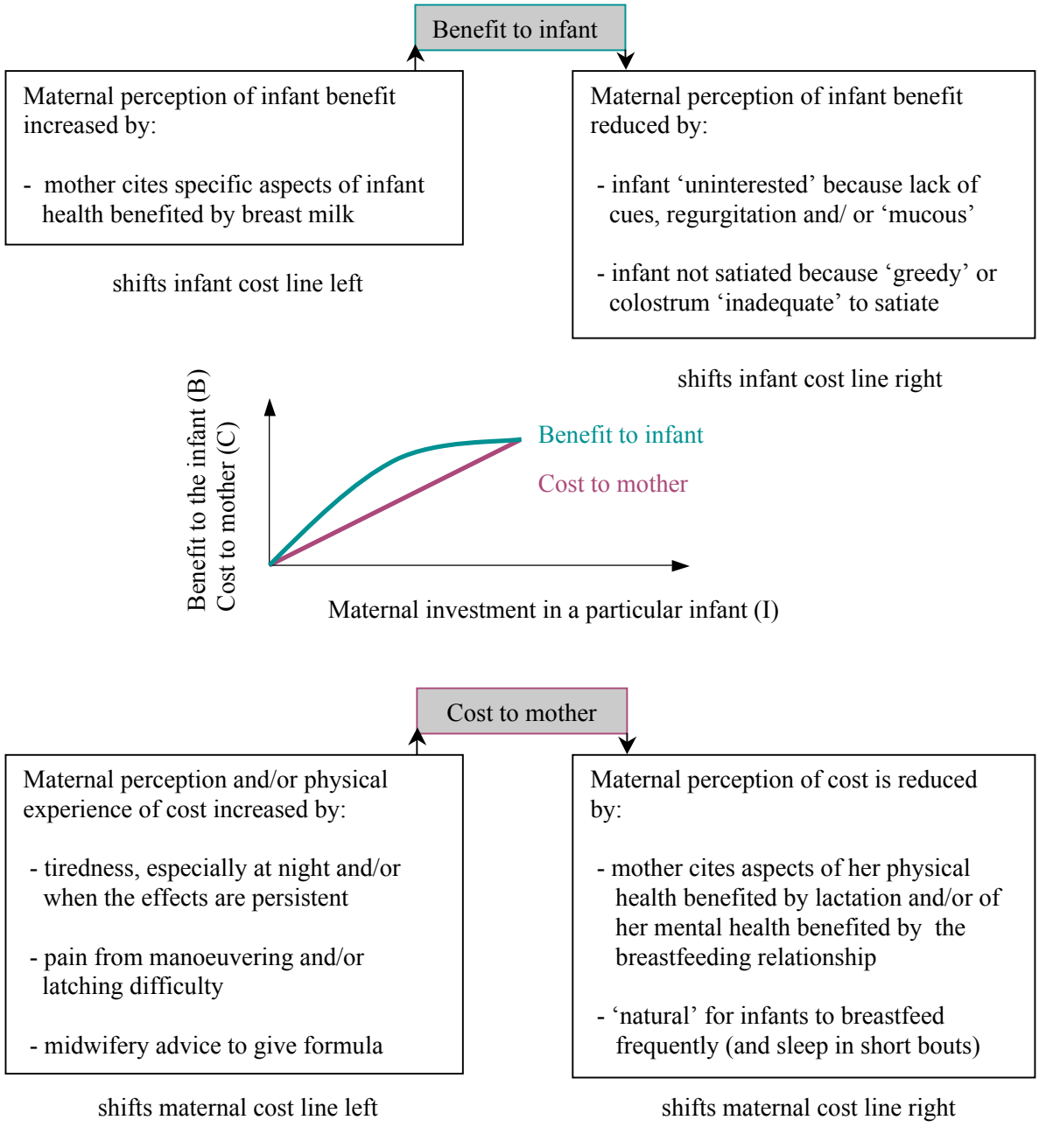
In this final chapter I review the extent to which I met the primary and secondary objectives of my research and summarise the ways in which this thesis contributes to knowledge.

Review of the research objectives

Principal objective 1: To investigate the factors that mothers report as influencing breastfeeding on the postnatal ward after a caesarean section delivery.

The data from Chapters 4, 6, 7 and 8 suggest that breastfeeding intent is multifaceted and its realisation after a caesarean section delivery is affected by: the physical condition of the mother-infant dyad; maternal perception of the costs and benefits of investment; and the postpartum environment. In Figure 9.1, I summarise that my findings can be understood using a cost-benefit analysis by extending Trivers's (1974) parent-offspring conflict model.

Figure 9.1: Maternal description of breastfeeding influences after a caesarean section.



The study did not include women who had vaginal delivery, so my results are not a comparison of the influences on breastfeeding after caesarean section compared to other modes. Future research could test breastfeeding outcomes before and after intervention in one or more of the cost/benefit breastfeeding influences summarised in Figure 9.1 among various populations.

More public health emphasis could be placed on the pathways in which breastfeeding impacts infant and especially maternal health. Greater focus on specific health outcomes could lead into an overview of the physiological impacts of breast milk and lactation. A deeper level of understanding among health professionals and families may instigate more practical support for the interconnected process of childbirth and infant feeding.

The normalcy of experiencing breastfeeding difficulties while dyads learn the relational process could be further emphasised in antenatal classes. Additionally, an evolutionary explanation for why infants are born so dependent on their caregiver may reassure mothers and their midwives that the observed newborn breastfeeding and sleep behaviour are to be expected. Awareness of the experiences in breastfeeding after a caesarean section presented in Chapters 6 and 8 could minimise the attribution of infant behaviour to personality traits and/or maternal difficulties as 'failure.'

Adherence to the Baby Friendly Hospital Initiative guidelines are important because midwifery advice for formula supplementation contributes to deviation from breastfeeding exclusivity, which may begin a cycle of infants receiving less breast milk. However, if an infant does receive formula in the early postpartum period, women can be supported in attempts to return to exclusive breastfeeding. A few formula feeds or occasional postnatal ward 'top-ups' are biologically suboptimal infant feeding behaviour, but better than termination of breastfeeding.

Investigation of midwifery perceptions of the above-mentioned breastfeeding factors may assist policymakers in prioritising infant feeding biology/ practical training and urge administrators to increase postnatal ward staffing, especially at night-time.

Principal objective 2: To test the efficacy of the side-car crib on increasing postnatal ward breastfeeding frequency compared to the standalone cot after a scheduled caesarean section delivery.

The data presented in Chapter 7 showed that the frequency and proportion of breastfeeding observed per hour in the overnight video recordings did not significantly differ by the randomly allocated postnatal ward cot types. Interpretation of the intention-to-treat results regarding the efficacy of the intervention are complicated because spontaneous bedsharing occurred with 11 of 35 filmed participants and formula supplementation of breastfeeding was documented in 7 of the 35 cases.

On-treatment analysis showed that bedsharers breastfeed significantly more frequently and for a significantly greater proportion of time compared to those who primarily used the side-car crib or standalone cot. The participant demographics in these self-selected groups differed so it cannot be inferred that bedsharing itself was associated with more the frequent breastfeeding. The motivations for bedsharing may have differed between groups of participants depending on whether they were allocated the side-car crib or standalone cot. This was explored in Chapter 7 and is summarised in relation to infant safety below.

No significant differences were found in either the mothers' or infants' sleep proportion by the intention-to-treat or on-treatment approaches, so the breastfeeding behaviour was not attributable to these aspects of the observation period.

The stationary camera and the relatively short periods of time against which the groups were measured is also a consideration for the validity of the data. However, a strength of the research is the precise measurements of behaviours from my continuous coding of the predetermined aspects of the observation data.

The greatest concern regarding data for this secondary principal objective is the reduced sample size obtained compared with that I had calculated as necessary to detect differential breastfeeding frequency between the two conditions. The statistical parameters and the rationale for the chosen variables were presented in Chapter 3. The study may have been under-powered from the onset, as comparison with data from Ball and colleagues' (2006) suggests that maternal cost of breastfeeding after scheduled caesarean section during this early postpartum period may be much greater than after non-opiate vaginal delivery. Additionally, maternal perception of infant benefit may have been reduced in my sample due to the effects of delivery/postpartum maternal drugs and/or disrupted physiological transition to extrauterine life. My various hypotheses for the differential results of my study and that conducted at the same location with similar protocol by Ball and her co-researchers were detailed in the Chapter 7 discussion.

I made as much progress in conducting a reliable randomised controlled trial as possible given the time constraints, inclusion/exclusion criteria and participant disqualification. Such a trial would be most effectively conducted by a team rather than a lone researcher.

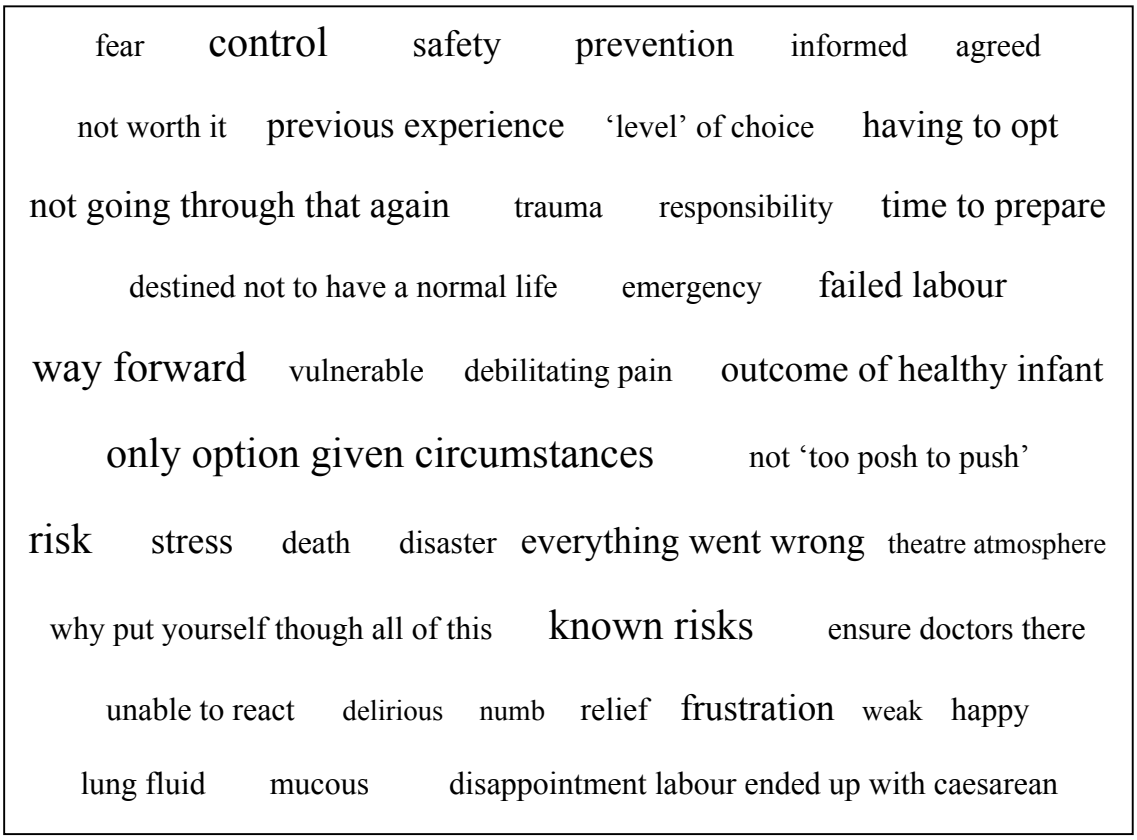
Although the quantitative data did not permit rejection of the null hypothesis (presented in Chapter 2), participants expressed strong preference for the side-car crib compared to the standalone cot. They described the intervention as permitting visual and physical access to their infants, enabling closeness, facilitating breastfeeding and minimising the need to request midwifery assistance. The pros and cons of both postnatal ward cot types were presented on pages 147-149, with the side-car cribs overwhelmingly preferred compared to the "awkward" standalone cots.

The randomised intervention was a unique experiment with dyads after a scheduled caesarean section and the data suggest that families may benefit from further research into the breastfeeding facilitation/hindrance from the postnatal ward cot types. Semi-structured interviews with mothers could replace overnight filming, as it would provide approximations of breastfeeding frequency between randomly allocated groups. Central to this methodology would be consistent application of the definition of sessions and timely data collection. While this approach might be easier to implement, the deeper perspective gained by observing the mother-infant interactions is lost.

***Secondary objective 1*:** To explore maternal reasoning for the decision to undergo a caesarean section delivery.

Chapter 5 demonstrated that many women described disadvantages to having a caesarean section, but these were outweighed by belief that the operation minimised potential harm to their infants and/or themselves. The emphasis given to the issues surrounding the decision for a caesarean section delivery are represented in Figure 9.2. The font size increases with participant description of the importance in relation to caesarean section decision-making.

Figure 9.2: Relative importance of themes in maternal reports of the decision for a caesarean section delivery.



The issues depicted in Figure 9.2 represent those that came to mind among the participants. These data were not collected in a survey format, so maternal responses could have been reported differently if each individual had been required to select from a predetermined range of options. Women who had vaginal deliveries (during the study period) were not interviewed, so the findings are not a comparison of the factors that led to the decision for a caesarean section instead of vaginal delivery. Future research could investigate how the above-mentioned factors are negotiated among women with different childbirth outcomes.

The information obtained via semi-structured interviews with mothers in the days after caesarean section delivery suggest that the decision to undergo a caesarean section made sense to both mothers and medical practitioners. Prioritisation of clinical 'control' and avoidance of potential harm resulting from vaginal parturition by utilising caesarean section delivery are consistent with our reliance on technology-dominated medicine. Women did not feel as though they were part of a 'factory production line' nor did the mothers indicate that medical practitioners were purposefully promoting caesarean section delivery to benefit themselves. Although impersonalised and/or unethical practice could have occurred, these data suggest individually tailored care that was as positive as possible given the circumstances.

The mutual perspective was that avoidance of possible harm was better achieved through the controlled application of caesarean section instead of the uncertainty and unnecessary stress of delivering vaginally. I suggest that health trade-offs include breastfeeding interruption, as documented through physical and potentially physiological pathways in Chapter 6 and 7. Inclusion of the interrelated obstacles in antenatal classes may enable more informed birth decisions and promote preparation for common postpartum experiences.

Additionally, more specific physiological information on parturition may minimise the need for caesarean section delivery and enable women more informed decisions when medical indications arise. Participants spontaneously addressed whether a caesarean section delivery was the "easy" route and dismissed what they perceived as a social (non-medical) critique of the operation. Scheduling delivery was preferred over having an unscheduled caesarean section because of having time to prepare and posing less stress to both mother (emotionally) and infant (physically). Most participants reiterated that they would not have undergone the caesarean section delivery if their circumstances were different, or if they had prenatally better realised the consequences of experiencing a caesarean section in relation to maternal pain and infant condition.

Women recounted more positive feelings about the caesarean section when the stages of the delivery were narrated and when they had seen how women coped postpartum. The mothers were often initially distracted from focusing on their newborn because of the activity surrounding the conclusion of the surgery.

Secondary objective 2: To analyse the safety of the side-car crib compared to the standalone cot on the postnatal ward when randomly allocated to mothers after a scheduled caesarean section delivery.

Chapter 7 showed that although infants were not observed or otherwise documented as experiencing harm, the standalone cot posed various hazards because of combination with the mothers' limited mobility. Participants using standalone cot were observed engaging in behaviours that may have harmed infants such as being unable to support their infants' heads as they were moved into the cot, the cot tipping as maternal weight was placed on the edge, a newborn being dropped a few inches into the cot and mothers being unable to quickly wipe the faces of their regurgitating babies.

I had excluded bedsharing as a randomised group when designing Phase 2, in contrast to Ball and colleagues (2006), because of concern regarding maternal mobility and awareness after a caesarean section delivery (refer to Chapter 3). No risk situations were observed while bedsharing. An area for future research is maternal motivation for postnatal ward bedsharing to assess the extent to which it is planned, "naturally happens" or is related to lack of a practical alternative after a caesarean section.

Chapter 7 data suggest that postnatal ward bedsharing was a reflection of breastfeeding for the side-car crib derived participants and a reaction to constraints among the standalone cot cross-overs. Bedsharers from the side-car crib breastfed twice as frequently per hour as those with the baby in bed instead of using the standalone cot. Infants could have been placed into the side-car cribs without mothers getting out of bed and infants slept on a pillow for a significantly greater proportion of time when bedsharing as an alternative to the allocated standalone cot. This is in contrast to bedsharers from the side-car crib, whose infants slept primarily on the mothers while in bed. Additionally, midwives were present for a significantly greater proportion of time among participants who primarily used the standalone cot – further indicating that limited mobility factored into women's night-time interactions.

The standalone cot may not just be inconvenient for mothers after a caesarean section, it may be institutionalised risk for newborns because of compromised handling when mothers are recovering while rooming-in.

***Secondary objective 3*:** To investigate the factors that mothers report as influencing breastfeeding at home over the six months after a caesarean section delivery.

Before hospital discharge, about half of women in both research phases were uncertain about how long they would breastfeed. Chapter 8 reported their plans as depending on infant weight gain, infant satiation, sufficient milk production and just "seeing how it goes." Semi-structured telephone interviews over the first six postpartum months indicated that the conflicting demands of frequent feeding, maternal tiredness and looking after oneself were reasons for altering infant care practices. Formula supplementation was common in the weeks before breastfeeding cessation, with participants most often beginning to use formula as an attempt to minimise night waking.

About 80% of the participants who initiated breastfeeding reported still doing so at two weeks postpartum. At six months, the proportion of participant breastfeeding dropped to 37% of Phase 1 and 32% of Phase 2. Exclusive breastfeeding was reported by 63% of Phase 1 and 42% of Phase 2 at two weeks and only one participant from both phases at six months. Breastfeeding difficulties were a great concern to the participants, with ramifications for the mother's feelings as well as the introduction of formula. An evolutionary perspective on infant development at birth, as presented in Chapter 2, may be beneficial for families in conceptualising 'normal' infant behaviour. If frequent breastfeeding were expected, women may not alter their caretaking strategies (to the same extent) to 'ameliorate the inadequacy' of breast milk in satiating infants. Additionally, if night waking was perceived as normal for human babies, parental confusion and/or frustration may be lessened.

Women who included a maternal benefit for their breastfeeding intent comprised a greater proportion of Phase 1 breastfeeding at every postpartum measure compared to those who cited only infant-based reasons. The differences were significant for any or exclusive breastfeeding at various weeks. These data indicate that perception of breastfeeding benefit for oneself may outweigh costs most strongly compared to those breastfeeding 'for the baby's sake.' Future research could test the hypothesis that maternal reasons for breastfeeding intent are associated with infant feeding outcomes.

The duration of breastfeeding was not associated with the randomly allocated cot types or the Phase 2 reported reasons for breastfeeding intent.

My data are limited by the sample size. Additionally, I did not analyse breastfeeding outcomes by length of time that women anticipated providing breast milk exclusively or at all (or the strength of their commitment) because of the small number of participants. Future research could distinguish when intended breastfeeding duration is not realised to ascertain where and when the greatest obstacles are encountered.

Some of the same issues, such as maternal tiredness, take on increasing importance with breastfeeding as time goes on. Bedsharing, both on the postnatal ward during the observation period and at home, was associated with significantly greater proportions of breastfeeding outcomes at various postpartum points. This relationship between infant feeding and sleep proximity is well established in the literature. The largely unintended practice suggests it may be used as a coping strategy to the cumulative tiredness some mothers experience with infant caretaking over time.

I was unable to investigate breastfeeding duration after unscheduled versus scheduled caesarean section delivery due to the small and imbalanced sample sizes. A much larger sample, with predetermined hypotheses, would be required for future research.

Theme of the findings

The theme running throughout the results reported in this thesis relates to breastfeeding trade-offs experienced by participants after caesarean section delivery. Balancing the conflicts led to disappointment between expressed intentions and actual outcomes:

Caesarean section delivery

Caesarean section was presented as being more controllable and preventing delivery harm, but postpartum pain was inevitable and "more debilitating" than (most) vaginal deliveries. Participants found that after a caesarean section delivery their infants were seemingly uninterested in feeding and had delayed uptake of breastfeeding because of expelling the lung fluid that had not been cleared or because of regurgitating mucous. Vaginal delivery was largely considered the ideal experience, but deemed unsafe with certain medical conditions. Labour was regarded as painful, unpredictable and as likely leading to maternal pelvic floor damage. Caesarean section delivery was not perceived as easy, with mothers recounting it as a strange experience that many felt distracted them from initial focus on their infants. The delivery was understood to be major surgery that left women "in agony" and "helpless." The participants also said that they would have "agreed to anything" when confronted with indications of foetal distress or to move forward from 'ineffective' labour.

Breastfeeding

Breastfeeding was mostly considered the "right thing to do," preferable, natural, "supposedly" healthier for baby and mom, but it was described as tiring, painful and limiting since it could only be done by the mother. Formula was described as containing chemicals and costing money, but it was perceived to better satiate infants, as easier and causing babies to sleep longer. Breastfeeding was discussed as being harder than anticipated, particularly demanding in the night and requiring perseverance. The need for maternal sleep and "thinking about yourself" was reinforced as a part of caesarean section recovery. Infrequent infant feeding was a cause for maternal concern but also regarded as beneficial by the participants because they used the opportunity to catch up on sleep. Other breastfeeding obstacles after a caesarean section delivery included mobility limitations, positioning difficulties and frustration at the need to rely on others to assist with infant care. Participants were confused and upset why infants were awake and crying at night after being breastfed, leading many to determine they were not producing enough milk.

Infant sleep location

The side-car crib was lauded as permitting visual and physical access compared to the standalone cot, but mothers still had to twist to an extent to get their babies. Breastfeeding frequency did not significantly vary between the randomly allocated postnatal ward cot types. The standalone cot could be pushed down the hallway [because some women were not able to carry their infants], but it necessitated that a mother get out of bed to safely access the infant. Maternal movement was painful and slow, posing potential risks related to infant handling. Bedsharing was an adopted strategy by many both on the postnatal ward and at home. The mothers explained that it settled infants more and made it easier to feed in the night, but it was not considered the proper place for infants by some and also caused some safety concerns among the mothers.

Summary

This thesis demonstrates my ability to conduct an original investigation through the exploration of the reasons that mothers reported for undergoing a caesarean section, investigation of the factors that participants reported as impacting breastfeeding and by testing the hypothesis that side-car cribs would promote more frequent postnatal ward breastfeeding. The approach of longitudinally interviewing participants from the postnatal

ward to six months postpartum contributed unique documentation of the maternal experience and mother-infant consequences of caesarean section delivery as the events were occurring, in contrast to the existing literature of retrospective data.

Evolutionary medicine is increasingly used as a starting point for formulating testable theories regarding human health. My trial of the randomly allocated postnatal ward cot types is an example of this application. The original contribution to knowledge is analysis of breastfeeding as a balance between evolved trade-offs in maternal and infant needs that are complicated by novel circumstances. Breastfeeding may be better enabled through: greater provision of physiological information; altered language (and subsequently conceptualisation) in childbirth and infant feeding; and more biologically appropriate environments for mothers to realise their intentions.

The parent-offspring conflict model I expanded from Trivers (1974) is helpful for interpreting the results of this study and may also be used in future research to test the effects of intervention in the factors that influence maternal perception of the costs and benefits of breastfeeding.

References

Adams-Chapman, I. 2008. Long-term neurologic outcome of infants born by cesarean section. *Clinics in Perinatology*, 35(2), 437-454.

Aiello, L.C. & Key, C. 2002. Energetic consequences of being a *Homo erectus* female. *American Journal of Human Biology*, 14(5), 551-565.

Ajzen, I. 1991. The theory of planned behavior. *Organizational Behavior & Human Decision Processes*, 50, 179–211.

Alderman, B., Weiss, N., Daling, J., Ure, C.L., & Ballard, J.H. 1986. Reproductive history and postmenopausal risk of hip and forearm fracture. *American Journal of Epidemiology*, 124(2), 262-267.

Allmark, P. & Spedding, M. 2007. Clinical trials in neonates: Ethical issues. *Seminars in Fetal & Neonatal Medicine*, 12(4), 318-323.

Al Tajir, G.K., Sulieman, H., & Badrinath, P. 2006. Intragroup differences in risk factors for breastfeeding outcomes in a multicultural community. *Journal of Human Lactation*, 22(1), 39-47.

Altman, D.G. & Bland, J.M. 1999. How to randomise. *British Medical Journal*, 11(7211), 703-704.

----- 2009. Parametric v non-parametric methods for data analysis. *British Medical Journal*, 338, a3167.

Altman, D.G., Schulz, K.F., Moher, D., Egger, M., Davidoff, F., Elbourne, D., Gøtzsche, P.C., & Lang, T. 2001. The revised CONSORT statement for reporting randomized trials: Explanation and elaboration. *Annals of Internal Medicine*, 134(8), 663-694.

Amir, L.H. 2006. Breastfeeding: Managing 'supply' difficulties. *Australian Family Physician*, 35(9), 686-689.

Anderson, G.C., Chu, S-H., Dombrowski, M.A., Swinth, J.Y., Albert, J.M., & Wada, N. 2003. Mother-newborn contact in a randomized trial of kangaroo (skin-to-skin) care. *Journal of Obstetric, Gynecologic, & Neonatal Nursing*, 32(5), 604-611.

Andrews, Z.B. 2005. Neuroendocrine regulation of prolactin secretion during late pregnancy: Easing the transition into lactation. *Journal of Neuroendocrinology*, 17(7), 466-473.

Antonovsky, A. 1979. *Health stress and coping: New perspectives on mental and physical well-being*. San Francisco: Jossey-Bass.

Anuntaseree, W., Mo-Suwan, L., Vasiknanonte, P., Kuasirikul, S., Ma-a-Lee, A., & Choprapawan, C. 2008. Night waking in Thai infants at 3 months of age: Association between parental practices. *Sleep Medicine*, 9(5), 564-571.

Aryeetry, R.N.O., Marqis, G.S., Timms, L., Lartey, A., & Brakohiapa, L. 2008. Subclinical mastitis is common among Ghanan women lactating 3 to 4 months postpartum. *Journal of Human Lactation*, 24, 263-267.

Ashcroft, B., Elstein, M., Boreham, N. & Holm, S. 2003. Prospective semistructured observational study to identify risk attributable to staff deployment, training, and updating opportunities for midwives. *British Medical Journal*, 327(7415), 584.

Avery, A., Zimmerman, K., Underwood, P.W., & Magnus, J.H. 2009. Confident commitment is a key factor for sustained breastfeeding. *Birth*, 36(2), 141-148.

Awi, D.D. & Alikor, E.A. 2006. Barriers to timely initiation of breastfeeding among mothers of healthy full-term babies who deliver at the University of Port Harcourt Teaching Hospital. *Nigerian Journal of Clinical Practice*, 9(1), 57-64.

Baddock, S.A. 2004. *Bedsharing vs cot-sleeping: An investigation of the physiology and behaviour of infants in the home setting*. Doctor of Philosophy thesis, University of Otago.

Bailit, J.L. & Love, T.E. The role of race in cesarean delivery rate case mix adjustment. *American Journal of Obstetrics & Gynecology*. 198(1), e1-e5.

Baker, J., Hurtado, M., Pearson, O., & James, T. 2008. Evolutionary medicine and obesity: Developmental adaptive responses in human body composition. In Trevathan, W.R., Smith, E.O., & McKenna, J.J. (Eds.). *Evolutionary medicine and health: New perspectives* (314-324). Oxford: Oxford University Press.

Ball, H.L. 2001. Triadic bed-sharing and infant temperature. *Ambulatory Child Health*, 28(1), 55-58.

----- 2002. *Risks to infants of sharing the parental bed: A physiological and behavioural study*. Final report to Scottish Cot Death Trust, Glasgow.

----- 2003. Breastfeeding, bed-sharing and infant sleep. *Birth*, 30(3), 181-188.

----- 2006a. Bed-sharing on the post-natal ward: Breastfeeding and infant sleep safety. *Paediatrics & Child Health*, 11(Suppl. A), 43A-46A.

----- 2006b. Parent-infant bed-sharing behavior: Effects of feeding type, and presence of father. *Human Nature*, 17(3), 301-318.

----- 2007. Bed-sharing practices of initially breastfed infants in the first 6 months of life. *Infant & Child Development*, 16(4), 387-401.

----- 2008. Evolutionary paediatrics: A case study in applying Darwinian medicine. In Elton, S. & O'Higgins, P. (Eds.). *Medicine and evolution: Current applications, future prospects* (127-152). London: CRC Press.

Ball, H.L. & Hooker, E. 1998. You wanna put a camera in our bedroom? Video observation of parent-infant cosleeping in the home environment (Abstract). Measuring Behaviour Conference. Groningen, The Netherlands. Accessed May 2007 at http://www.noldus.com/events/mb98/abstracts/ball.htm.

Ball, H.L., Hooker, E., & Kelly, P.J. 1999. Where will the baby sleep? Attitudes and practices of new and experienced parents regarding cosleeping with their new-born infants. *American Anthropologist*, 101(1), 143-151.

Ball, H.L. & Panter-Brick, C. 2001. Child survival and the modulation of parental investment. In Ellison, P. (Ed.). *Reproductive ecology and human evolution* (249-266). New York: Aldine de Gruyter.

Ball, H.L., Ward-Platt, M.P., Heslop, E., Leech, S.J., & Brown, K.A. 2006. Randomised trial of infant sleep location on the postnatal ward. *Archives of Disease in Childhood*, 91(12), 1005-1010.

Banks, M. 2001. *Visual methods in social research*. London: Sage Publications.

Barker, P.M. & Southern, K.W. 2004. Regulation of liquid secretion and absorption by the fetal and neonatal lung. In Rolin, R.A., Fox, W.W., & Abman, S.H. (Eds.). *Fetal and neonatal physiology* (3rd ed.). Philadephia: Saunders.

Barnum, H. & Kutzin, J. 1993. *Public hospitals in developing countries*. Baltimore: The Johns Hopkins University Press.

Barrickman, N.L., Bastian, M., Isler, K., & van Scalk, C.P. 2008. Life history costs and benefits of encephalization: A comparative test using data from long-term studies of primates in the wild. *Journal of Human Evolution*, 54(5), 568-590.

Bartington, S., Griffiths, L.J., Tate, A.R., & Dezateux, C. 2006. Are breastfeeding rates higher among mothers delivering in Baby Friendly accredited maternity units in the UK? *International Journal of Epidemiology*, 35(5), 1178-1186.

Beck, C.T. 2006. Pentadic cartography: Mapping birth trauma narratives. *Qualitative Health Research*, 16(4), 453-466.

Beebe, K.R., Lee, K.A., Carrieri-Kohlman, V., & Jumphreys, J. 2007. The effects of childbirth self-efficacy and anxiety during pregnancy on prehospitalization labor. *Journal of Obstetric, Gynecologic, & Neonatal Nursing*, 36(5), 410-418.

Bennet, T. & Kotelchuck, M. 1997. Mothers and infants. In Kotch, J.B. (Ed.). *Maternal and child health: Programs, problems, and policy in public health*(85-114). Gaithersburg, Maryland: Aspen Publishers.

Ben Shaul, D.M. 1962. The composition of the milk of wild animals. *International Zoo Yearbook*, 4, 333-342.

Bentley, G. 2007. Environmental effects on human reproduction. In Nesse, R. (Ed.). *Evolution and Medicine: How New Applications Advance Research and Practice*. The Biomedical & Life Sciences Collection. London: Henry Stewart Talks Limited.

Benyshek, D.C. & Watson, J.T. 2006. Exploring the thrifty genotype's food-shortage assumptions: A cross-cultural comparison of ethnographic accounts of food security among foraging and agricultural societies. *American Journal of Physical Anthropology*, 131(1), 120-126.

Bereczkei, T. 2001. Maternal trade-off in treating high-risk children. *Evolution and Human Behavior*, 22(3), 197-212.

Berger, P.J., Smolich, J.J., Ramsden, C.A., & Walker, A.M. 1996. Effect of lung liquid volume on respiratory performance after caesarean delivery in the lamb. *The Journal of Physiology*, 492(Pt. 3), 905-912.

Berry, N.J. & Gribble, K.D. 2008. Breast is no longer best: Promoting normal infant feeding. *Maternal and Child Nutrition*, 4(1), 74-79.

Betrán, A.P., Merialdi, M., Lauer, J.A., Bing-Shun, W., Thomas, J., Van Look, P., & Wagner, M. 2007. Rates of caesarean section: Analysis of global, regional and national estimates. *Paediatric & Perinatal Epidemiology*, 21(2), 98-113.

Binns, C.W., Gilchrist, D., Woods, B., Gracey, B., Gracey, M., Scott, J., Smith, H., Zhang, M., & Roberman, B. 2006. Breastfeeding by Aboriginal mothers in Perth. *Nutrition & Dietetics*, 63(1), 8-14.

Blackburn, S.T. 2007. *Maternal, fetal, and neonatal physiology: A clinical perspective* (3rd ed.). St. Louis, MO: Saunders Elsevier.

Blair, P.S. & Ball, H.L. 2004. The prevalence and characteristics associated with parent-infant bed-sharing in England. *Archives of Disease in Childhood,* 89, 1106-1110.

Blair, P.S., Fleming, P.J., Ball, H.L., & Ward-Platt, M.P. 2001. Surprised by publication (Letter). *Pediatrics* 108(5), 1239-1240.

Blair, P.S., Fleming, P.J., Smith, I.J., Ward-Platt, M., Young, J., Nadin, P., Berry, P.J., & Golding, J. 1999. Babies sleeping with parents: Case-control study of factors influencing the risk of the sudden infant death syndrome. *British Medical Journal*, 319(7223), 1457-1462.

Bland, M. 2000. *An introduction to medical statistics* (3rd ed.). Oxford: Oxford University Press.

Bland, R.D., Hansen, T.N., Haberkern, C.M., Bressack, M.A., Hazinski, T.A., Raj, J.U., & Goldberg, R.B. 1982. Lung fluid balance in lambs before and after birth. *Journal of Applied Physiology*, 53(4), 992-1004.

Blum, D. 2002. *Love at Goon Park: Harry Harlow and the science of affection*. Chichester, England: Wiley.

Bogin, B. 1999. *Patterns of human growth*. Cambridge: Cambridge University Press.

Bogin, B., Silva, M.I., & Rios, L. 2007. Life history trade-offs in human growth: Adaptation or pathology? *American Journal of Human Biology*, 19(5), 631-642.

Bolling, K., Grant, C., Hamlyn, B., & Thornton, A. 2007. *Infant Feeding Survey 2005*. London: The Information Centre.

Bostock, J. 1962. Evolutional approach to infant care. *The Lancet*, 279(7238), 1033-1035.

Bourdieu, P. & Passeron, J.C. 1990[1977]. *Reproduction in education, society and culture*. London: Sage Publications.

Bowlby, J. 1969. *Attachment and loss* (Vol. 1: Attachment). London: Pimlico.

Bribiescas, R.G. & Ellison, P.T. 2008. How hormones mediate trade-offs in human health and disease. In Stearns, S.C. & Koella, J. (Eds.). *Evolution in health and disease* (2nd ed.) (77-94). Oxford: Oxford University Press.

British Broadcasting Company (BBC) [author unspecified]. 2007, 15 February. Experts' warning over caesareans. Accessed May 2007 at http://news.bbc.co.uk/1/hi/england/oxfordshire/6364365.stm.

Bryaton, J., Gagnon, A.J., Johnston, C., & Hatem, M. 2008. Predictors of women's perceptions of the childbirth experience. *Journal of Obstetric, Gynecologic, & Neonatal Nursing*, 37(1), 24-34.

Bryman, A. 2008. *Social research methods* (3rd ed.). Oxford: Oxford University Press.

Buchanan, D. 2006. Moral reasoning as a model for health promotion. *Social Science & Medicine*, 63(10), 2715-2726.

Buswell, S.D. & Spatz, D.L. 2007. Parent-infant co-sleeping and its relationship to breastfeeding. *Journal of Pediatric Health Care*, 21(1), 22-28.

Butte, N.F., Lopez-Alarcon, M.G., & Garza, C. 2002. *Nutrient adequacy of exclusive breastfeeding for the term infant during the first six months of life*. Geneva: World Health Organization. Accessed October 2008 at http://whqlibdoc.who.int/publications/9241562110.pdf.

Bystrova, K., Ivanova, V., Edhorg, M., Matthiesen, A., Ransjö-Arvidson, A., Mukhamedrakhimov, R., Uvnäs-Moberg, K., & Widström, A. 2009. Early contact versus separation: effects on mother-infant interaction one year later. *Birth*, 36(2), 91-109.

Callahan, S., Séjourné, N., & Denis, A. 2006. Fatigue and breastfeeding: An inevitable partnership? *Journal of Human Lactation*, 22(2), 182-187.

Callen, J. & Pinelli, J. 2004. Incidence and duration of breastfeeding for term infants in Canada, United States, Europe, and Australia: A literature review. *Birth*, 31(4), 285-292.

Callister, L.C. 2004. Making meaning: Women's birth narratives. *Journal of Obstetric, Gynecologic, & Neonatal Nursing*, 33(4), 508-518.

Campbell, M.K., Snowdon, C., Francis, D., Elbourne, D., McDonald, A.M., Knight, R., Entwistle, V., Garcia, J., & Grant, A. 2007. Recruitment to randomised trials: Strategies for trial enrolment and participation study. The STEPS study. *Health Technology Assessment*, 11(48), 1-126.

Cantrill, R.M., Creedy, D.K., & Cooke, M. 2003. How midwives learn about breastfeeding. *Australian Journal of Midwifery*, 16(3), 25-30.

Carfoot, S., Williamson, P., & Dickson, R. 2005. A randomised controlled trial in the north of England examining the effects of skin-to-skin on breast feeding. *Midwifery*, 21(1), 71-79.

Carolan, M. 2006. Women's stories of birth: A suitable form of research evidence? *Women & Birth*, 19(3), 65-71.

Carpenter, R.G., Irgens, L.M., Blair, P.S., England, P.D., Fleming, P., Huber, J., Jorch, G., & Schreuder, P. 2004. Sudden unexplained infant death in 20 regions in Europe: Case control study. *The Lancet*, 363(9404), 185-191.

Cartwright, J.H. 2000. *Evolutionary explanations of human behaviour*. New York: Taylor & Francis Inc.

Cassidy, T. 2006. *Birth: A history*. London: Chatto & Windus.

Cattaneo, A., Ronfani, L., Burmaz, T., Quintero-Romero, S., Macaluso, A., & Di Mario, S. 2006. Infant feeding and cost of health care: A cohort study. *Acta Pædiatrica*, 95(5), 540-546.

Central Office for Research Ethics (COREC). 2005. Guidelines for researchers: Information sheets and consent forms (Ver. 2). Accessed December 2005 at http://www.nres.npsa.nhs.uk/rec-community/guidance/#PIS.

Cesario, S.K. 2004. Reevaluation of Friedman's labor curve: A pilot study. *Journal of Obstetric, Gynecologic & Neonatal Nursing*, 60(4), 217-219.

Chadwick, J. & Mann, W.N. (Translators) 1950. Oath of Hippocrates. Accessed October 2008 at http://history.nih.gov/laws/pdf/hippocratic.pdf.

Chalmers, B. 2006. Why do women go along with this stuff? (Roundtable) *Birth*, 32(2), 155-156.

Chalmers, B., Levitt, C., Heaman, M., O'Brien, B., Sauve, R., & Kaczorowsk, J. 2009. Breastfeeding rates and hospital breastfeeding practices in Canada: A national survey of women. *Birth*, 36(2), 122-132.

Chang, A.B., Wilson, S.J., Masters, I.B., Yuill, M., Williams, J., Williams, G., & Hubbard, M. 2003. Altered arousal response in infants exposed to cigarette smoke. *Archives of Disease in Childhood*, 88(1), 30-33.

Chang, Z.M. & Heaman, M.I. 2005. Epidural analgesia during labor and delivery: Effects on the initiation and continuation of effective breastfeeding. *Journal of Human Lactation*, 21(3), 305-314.

Chantry, C.J., Howard, C.R., Lawrence, R.A., Marinelli, K.A., & Powers, N.G. 2009. Academy of Breastfeeding Medicine Clinical Protocol #19: Breastfeeding promotion in the prenatal setting. *Breastfeeding Medicine*, 4(1), 43-45.

Chapman, D.J. & Perez-Escamilla, R. 1999a. Does delayed perception of the onset of lactation shorten breastfeeding duration? *Journal of Human Lactation*. 15(2), 107–111.

----- 1999b. Identification of risk factors for delayed onset of lactation. *Journal of the American Dietetic Association*, 99(4), 450-454.

Chen, A. & Rogan, W.J. 2004. Breastfeeding and the risk of postneonatal death in the United States. *Pediatrics*, 113(5), 435-439.

Chen, D.C., Nommsen-Rivers, L., Dewey, K.G., & Lönnerdal, B. 1998. Stress during labor and delivery and early lactation performance. *The American Journal of Clinical Nutrition*, 68, 335-344.

Chertok, I.R. 2006. Breast-feeding initiation among post-caesarean women of the Negev, Israel. *British Journal of Nursing*, 15(4), 205-208.

Chertok, I.R. & Shoham-Vardi, I. 2008. Infant hospitalization and breastfeeding post-caesarean section. *British Journal of Nursing*, 17(12), 786-791.

Cheyney, M.J. 2008. Homebirth as systems-challenging praxis: Knowledge, power, and intimacy in the birthplace. *Qualitative Health Research*, 18(2), 254-267.

Churchill, H., Savage, W., & Francome, C. 2006. *Caesarean birth in Britain: A book for health professionals and parents* (Updated). Middlesex, England: Middlesex University Press.

Clifford, J. & McIntyre, E. 2008. Who supports breastfeeding? *Breastfeeding Review*, 16(2), 9-19.

Clutton-Brock, T.H. 1991. *The evolution of parental care*. Princeton, NJ: Princeton University Press.

Coalition for Improving Maternity Services (CIMS). 2007. Evidence basis for the Ten Steps of Mother-Friendly care. *Perinatal Education*, 16(1), 1S-96S.

Cooke, R.W.I. 2005. Good practice in consent. *Seminars in Fetal & Neonatal Medicine*, 10(1), 63-71.

Costa, M., Frau, C., Urbinati, L., & Bitti, P.E.R. 2008. Mock aggression behavior in adolescents: An observational study (Abstract). *International Society for Human Ethology Conference XIX*, 35-36.

Côté, A. 2006. Bed sharing and sudden infant death syndrome: Do we have a definition problem? *Paediatrics & Child Health*, 11(Suppl. A), 34A-38A.

Cramton, R., Zain-Ul-Abideen, M., & Whalen, B. 2009. Optimizing successful breastfeeding in the newborn. *Current Opinion in Pediatrics*, 21(3), 386-396.

Creswell, J.W. 2007. *Qualitative inquiry and research design: Choosing among five approaches* (2nd ed.). Thousand Oaks, California: Sage Publications.

Cummings, R. & Klineberg, R. 1993. Breastfeeding and other reproductive factors and the risk of hip fractures in elderly women. *International Journal of Epidemiology,* 22(4), 684-691.

Cummins, S., Curtis, S., Diez-Roux, A.V., & Macintyre, S. 2007. Understanding and representing 'place' in health research: A relational approach. *Social Science & Medicine*, 65(9), 1825-1838.

Cunningham, J.B. & McCrum-Gardner, E. 2007. Power, effect and sample size using G-power: Practical issues for researchers and members of research ethics committees. *Evidence Based Midwifery*, 5(4), 132-136.

Dall, S.R.X. & Boyd, I.L. 2004. Evolution of mammals: Lactation helps mothers to cope with unreliable food supplies. *Proceedings of the Royal Society*, 271(1552), 2049-2057.

Darvill, R., Skirton, H., & Farrand, P. 2008. Psychological factors that impact on women's experiences of first-time motherhood: A qualitative study of the transition. *Midwifery*, doi:10.1016/j.midw.2008.07.006.

Davis-Floyd, R.E. 1993. The technocratic model of birth. In Hollis, S.T., Pershing, L., & Young, M.J. (Eds.). *Feminist theory in the study of folklore* (297-326). Champaign, IL: University of Illinois Press.

----- 2004. Foreword. In Downe, S. (Ed.). *Normal childbirth: Evidence and debate* (ix-xiii). London: Churchill Livingstone.

Davis-Floyd, R.E. & Sargent, C.F. 1997. Introduction: The anthropology of birth. In Davis-Floyd, R.E. & Sargent, C.F. (Eds.). *Childbirth and authoritative knowledge: Cross-cultural perspectives* (1-51). Berkeley: University of California Press.

Davis-Floyd, R.E. & St. John, G. 1998. *From doctor to healer: The transformative journey*. New Brunswick, NJ: Rutgers University Press.

De Carvalho, M., Robertson, S., Friedman, A., & Klaus, M. 1983. Effect of frequent breast-feeding on milk production and infant weight gain. *Pediatrics*, 72(3), 307-311.

Declercq, E., Cunningham, D.K., Johnson, C., & Sakala, C. 2008. Mothers' reports of postpartum pain associated with vaginal and cesarean deliveries: Results of a national survey. *Birth*, 35(1), 16-24.

Declercq, E., Labbok, M.H., Sakala, C., & O'Hara, M. 2009. Hospital practices and women's likelihood of fulfilling their intention to exclusively breastfeed. *American Journal of Public Health*, 99(5), 929-935.

De Luca, R., Boulvain, M., Irion, O., Berner, M., & Pfister, R.E. 2009. Incidence of early neonatal mortality and morbidity after late-preterm and term cesarean delivery. *Pediatrics*, 123(6), e1064-e1071.

Dement, W.C. & Vaughn, C. 1999. *The promise of sleep*. New York: Dell Publishing.

Dennis, C. 2002. Breastfeeding initiation and duration: A 1990–2000 literature review. *Journal of Obstetric, Gynecologic, & Neonatal Nursing,* 31(3), 12-32.

Derrick, D.C., Lowdon, G., & Barlow, F. 2004. *Caesarean birth: Your questions answered*. London: The National Childbirth Trust.

Deschamps, J-P. 2008. Perspectives: What are the research needs? *International Journal of Health Promotion & Education*, 15(Suppl. 1), 98-101.

DeSilva, J.M. & Lesnik, J.J. 2008. Brain size at birth throughout evolution: A new method for estimating neonatal brain size in hominins. *Journal of Human Evolution*, 55(6), 1064-1074.

Devane, D., Begley, C.M., & Clarke, M. 2004. How many do I need? Basic principles of sample size estimation. *Journal of Advanced Nursing*, 47(3), 297-302.

Dewey, K.G. 2001. Maternal and fetal stress are associated with impaired lactogenesis in humans. *Journal of Nutrition*, 131(11), 3012S-2015S.

Dewey, K.G., Nommsen-Rivers, L.A., Heinig, J., & Cohen, R.J. 2003. Risk factors for suboptimal infant breastfeeding behavior, delayed onset of lactation, and excess neonatal weight loss. *Pediatrics*, 112(3), 607-619.

Dickson-Swift, V., James, E.L., Kippen, S., & Liamputtong, P. 2007 Doing sensitive research: What challenges do qualitative researchers face? *Qualitative Research*, 7(3), 327-353.

DiMatteo, M.R., Morton, S.C., Lepper, H.S., Damush, T.M., Carney, M.F., Pearson, M., & Kahn, K.L. 1996. Cesarean childbirth and psychosocial outcomes: A meta-analysis. *Health Psychology*, 15(4), 303-314.

Di Renzo, G.C. & Simeoni, U. 2006. *The prenate and the neonate: An illustrated guide to the transition to extrauterine life*. Abington, England: Informa Healthcare.

Donath, S.M. & Amir, L.H. 2008. Effect of gestation on initiation and duration of breastfeeding. *Archives of Disease in Childhood – Fetal & Neonatal Edition*, 93(6), F448-F450.

Downe, S. & McCourt, C. 2004. From being to becoming: Reconstructing childbirth knowledges. In Downe, S. (Ed.) *Normal childbirth: Evidence and debate* (3-24). London: Churchill Livingstone.

Dufour, D.L. & Sauther, M.L. 2002. Comparative and evolutionary dimensions of the energetics of human pregnancy and lactation. *American Journal of Human Biology*, 14(5), 584-602.

Duijts, L., Ramadhani, M.K., & Moll, H.A. 2009. Breastfeeding protects against infectious diseases during infancy in industrialized countries. A systematic review. *Maternal & Child Nutrition*, 5(3), 199-210.

Dunbar, R. 1998. The social brain hypothesis. *Evolutionary Anthropology*, 6(5), 178-190.

Dy, S.M., Rubin, H.R., & Lehmann, H.P. 2005. Why do patients and families request transfers to tertiary care? A qualitative study. *Social Science & Medicine*, 61(8), 1846-1853.

Dykes, F. 2002. Western medicine and marketing: Construction of an inadequate milk syndrome in lactating women. *Health Care for Women International*, 23(5), 492-502.

----- 2006. *Breastfeeding in hospital: Mothers, midwives and the production line*. London: Routledge.

Dyson, L., Renfrew, M., McFadden, A., McCormick, F., Herbert, G. & Thomas, J. 2006. *Promotion of breastfeeding initiation and duration: Evidence into practice briefing*. National Institute of Clinical Health and Excellence: London.

Easton, K.L., McComish, J.F., & Greenberg, R. 2000. Avoiding common pitfalls in qualitative data collection and transcribing. *Qualitative Health Research*, 10(5), 703-707.

Eaton, S.B., Strassman, B.I., Nesse, R.M., Neel, J.V., Ewald, P.W., Wiliams, G.C., Weder, A.B., Eaton, S.B. III, Lindeberg, S., Konner, M.J., Mysterud, I., & Cordain, L. 2002. Evolutionary health promotion. *Preventative Medicine*, 34(2), 109-118.

Ecker, J.L., Chen, K.T., Cohen, A.P., Riley, L.E., & Lieberman, E.S. 2001. Increased risk of cesarean delivery with advancing maternal age: Indications and associated factors in nulliparous women. *American Journal of Obstetrics & Gynecology*, 185(4), 883-887.

Ecker, J.L. & Frigoletto, F.D. 2007. Cesarean delivery and the risk-benefit calculus. *The New England Journal of Medicine*, 356(9), 885-888.

Eibl-Eibesfeldt, I. 1989. *Human ethology: Foundations of human behavior.* New York: Aldine de Gruyter.

Eichenwald, E.C. & Stark, A.R. 2008. Management and outcomes of very low birth weight. *New England Journal of Medicine,* 358(16), 1700-1711.

Eisenberg, L. 1988. Science in medicine: Too much or too little and too limited in scope? *The American Journal of Medicine*, 84(3), 483-491.

Ellison, P.T. 2001. *On fertile ground*. Cambridge, MA: Harvard University Press.

----- 2003. Energetics and reproductive effort. *American Journal of Human Biology,* 15(3), 342–351.

Ellison, P.T. & Jasienska, G. 2008. Adaptation, health, and the temporal domain of human reproductive physiology. In Panter-Brick, C. & Fuentes, A. (2008). *Health, risk, and adversity* (108-128). Oxford: Berghahn Books.

Elton, S. & O'Higgins, P. 2008. Is there a place for evolutionary medicine in UK medical education? In Elton, S. & O'Higgins, P. (Eds.). *Medicine and evolution: Current applications, future prospects* (257-271). London: CRC Press.

Eltzchig, H., Leiberman, E.S., & Camann, W.R. 2003. Regional anesthesia and analgesia for labor and delivery. *The New England Journal of Medicine,* 384(4), 319-332.

Engle, W.A. & Kominiarek, M.A. 2008. Late preterm infants, early term infants, and timing of elective deliveries. *Clinics in Perinatology*, 35(2), 325-341.

Enkin, M., Keirse, M.J.N.C., Neilson, J., Crowther, C., Duley, L., Hodnett, E., & Hofmeyr, J. 2000. *A guide to effective care in pregnancy and childbirth*. Oxford: Oxford University Press.

Evans, K.C., Evans, R.G., Ryoal, R., Esterman, A.J., & James, S.L. 2003. Effect of cesarean section on breast milk transfer to the normal term newborn over the first week of life. *Archives of Disease in Childhood – Fetal & Neonatal Edition*, 88(5), F380-F382.

Evans-Pritchard, E.E. 1973. Some reminiscences and reflections on fieldwork. *Journal of the Anthropological Society of Oxford*, 4, 1-12. In Bryman, A. (Ed.). *Ethnography* (Vol. 1) (68-81). London: Sage Publications, 2001.

Fägerskiöld, A. A change in life as experienced by first-time fathers. *Scandinavian Journal of Caring Sciences*, 22(1), 64-71.

Fardig, J.A. 1980. A comparison of skin-to-skin contact and radiant heaters in promoting neonatal thermo-regulation. *Journal of Nurse-Midwifery,* 25(1), 19-28.

Fathalla, M.F. & Fathalla, M.M.F. 2004. *A practical guide for health researchers*. Geneva: World Health Organization. Accessed May 2007 at http://whqlibdoc.who.int/emro/2004/9290213639.pdf.

Fergusson, D., Aaron, S.D., Guyatt, G.H., & Hébert, P. 2002. Post-randomisation exclusions: The intention to treat principle and excluding patients from analysis. *British Medical Journal*, 325(7365), 652-654.

Ferrari, L. & Addessi, A.R. 2008. Cheek to cheek: Observation of interactions among toddlers (Abstract). *International Society for Human Ethology Conference XIX*, 36-37.

Ferraro, G., Trevathan, W., & Levy, J. 1994. *Anthropology: An applied perspective*. St. Paul, Minnesota: West Publishing Company.

Field, A. 2009. *Discovering statistics using SPSS* (3rd ed.). London: Sage Publications.

Fildes, V. 1986. *Breasts, bottles and babies: A history of infant feeding*. Edinburgh: Edinburgh University Press.

Fisher, C., Hauck, Y., & Fenwick, J. 2006. How social context impacts on women's fears of childbirth: A Western Australian example. *Social Science & Medicine*, 63(1), 64-75.

Fleming, P. & Blair, P.S. 2007. Sudden infant death syndrome and parental smoking. *Early Human Development*, 83(11), 721-725.

Flick, U. (Ed.). 2007. *Managing quality in qualitative research*. London: Sage Publications.

Ford, G. 2003. *The complete sleep guide for contended babies and toddlers*. London: Vermilion.

----- 2006. *Good mother bad mother*. London: Vermilion.

Forster, D.A., McLachlan, H.L., Rayner, J., Yelland, J., Gold, L., & Rayner, S. 2008. The early postnatal period: Exploring women's views, expectations and experiences of care using focus groups in Victoria, Australia. *BMC Pregnancy & Childbirth*, 8, 27. doi:10.1186/1471-2393-8-27.

Franciscus, R.G. 2009. When did the modern human pattern of childbirth arise? New insights from an old Neandertal pelvis. *Proceedings of the National Academy of Sciences of the United States of America*, 106(23), 9125-9126.

Francome, C., Savage, W., Churchill, H., & Lewison, H. 2003. *Caesaran birth in Britain: A book for health professionals and parents*. Middlesex, Engalnd: Middlesex University Press.

Friedman, E. 1954. The graphic analysis of labor. *American Journal of Obstetrics & Gynecology*, 68(6), 1568-1575.

Fuentes, A. 2009. *Evolution of human behaviour*. Oxford: Oxford University Press.

Gartner, L.W., Morton, J., Lawrence, R.A., Naylor, A.J., O'Hare, D., Schanler, R.J., & Eidelman, A.I. 2005. Breastfeeding and the use of human milk. *Pediatrics*, 115(2), 496-506.

Geluda, K., Bisaglia, J.B., Moreira, V., Maldonado, M., Cunha, A.J.L.A., & Trajman, A. 2005. Third-party informed consent in research with adolescents: The good, the bad and the ugly. *Social Science & Medicine*, 61(5), 985-988.

Giles, M., Connor, S., McClenahan, C., Mallett, J., Stewart-Knox, B., & Wright, M. 2007. Measuring young people's attitudes to breastfeeding using the Theory of Planned Behaviour. *Journal of Public Health*, 29(1), 17-26.

Gillespie, B., d'Arcy, H., Scwartz, K., Bobo, J.K., & Foxman, B. 2006. Recall of age of weaning and other breastfeeding variables. *International Breastfeeding Journal*, 1, 4. doi:10.1186/1746-4358-1-4

Ginzel, K.H., Martiz, K.H., Marks, D.F., Neuberger, M., Polito, J.R., Schulte-Herman, R., & Slotkin, T.A. 2007. Nicotine for the fetus, the infant and the adolescent? *Journal of Health Psychology*, 12(2), 215-224.

Goma, H.M., Said, R.N. & El-Ela, A.M. 2008. Study of the newborn feeding behaviours and fentanyl concentration in colostrum after an analgesic dose of epidural and intravenous fentanyl in cesarean section. *Saudi Medical Journal*, 29(5), 678-682.

Gould, S.J. 1977. *Ontogeny and phylogeny*. Cambridge, MA: Harvard University Press.

Graffy, J. & Taylor, J. 2005. What information, advice, and support do women want with breastfeeding? *Birth*, 32(3), 179-186.

Gray, L., Watt, L., & Blass, E.M. 1999. Skin-to-skin contact is analgesic in healthy newborns. *Pediatrics*, 105(1), e14.

Green, L.W. 2006. Public health asks of systems science: To advance our evidence-based practice, can you help get us more practice-based evidence? *American Journal of Public Health*, 96(3), 406-413.

Griffin, W.C. III, Skinner, H.D., Salm, A.K., & Birkle, D.L. 2003. Mild prenatal stress in rats is associated with enhanced conditioned fear. *Physiology & Behavior*, 79(2), 209-215.

Haig, D. 1993. Genetic conflicts in human pregnancy. *Quarterly Review of Biology*, 68(4), 495-532.

----- 2007. Genetic conflicts in human pregnancy. In Nesse, R. (Ed.). *Evolution and Medicine: How New Applications Advance Research and Practice*, The Biomedical & Life Sciences Collection. London: Henry Stewart Talks Limited.

----- 2008. Intimate relations: Evolutionary conflicts of pregnancy and childhood. In Stearns, S.C. & Koella, J. (Eds.). *Evolution in health and disease* (2nd ed.). (65-76). Oxford: Oxford University Press.

Hake-Brooks, S.J. & Anderson, G.C. 2008. Kangaroo care and breastfeeding of mother-preterm infant dyads 0-18 months: A randomized, controlled trial. *Neonatal Network*, 27 (3), 151-159.

Hale, T.W. 2006. *Medications and mothers' milk: A manual of lactational pharmacology* (12th ed.). Armarillo, TX: Hale Publishing.

Hallman, M., Kulovich, M., Kirtpatrick, E., Sugarman, R.G., & Gluck, L. 1976. Phosphatidylinositol and phosphatidylglycerol in amniotic fluid: Indices of lung maturity. *American Journal of Obstetrics & Gynecology*. 125(5), 613-617.

Hamilton, B.E., Martin, J.A., & Ventura, S.J. 2009. *Births: Preliminary data for 2007.* Washington, DC: Centers for Disease Control and Prevention National Vital Statistics System. Accessed September 2009 at http://www.cdc.gov/nchs/data/nvsr/nvsr57/nvsr57_12.pdf.

Hamilton, W.D. 1964. The genetical evolution of social behavior. *Journal of Theoretical Biology* 7(1), 1-16.Hamosh, M. 2001. Bioactive factors in human milk. *Pediatric Clinics of North America*, 48(1), 69-86.

Hannah, M.E., Hannah, W.J., Hewson, S.A., Hodnett, E.D., Saigal, S., & Willan, A.R. 2000. Planned caesarean section versus planned vaginal birth for breech presentation at term: A randomised multicentre trial. *The Lancet*, 356(9239), 1375-1383.

Hanretty, K.P. 2003. *Obstetrics illustrated* (6th ed.). London: Churchill Livingstone.

Hansen, A.K., Wisborg, K., Uldbjerg, N., & Henriksen, T.B. 2008. Risk of respiratory morbidity in term infants delivered by elective caesarean section: Cohort study. *British Medical Journal*. 336(7635), 85-87.

Hanson, L.A. 2004. *Immunobiology of human milk: How breastfeeding protects babies*. Armarillo, TX: Pharmasoft Publishing.

Harlow, H.F. 1958. The nature of love. *American Psychologist*, 13, 673-685.

Hartman, H. 1939. *Ego psychology and the problem of adaptation*. New York: International Universities Press.

Hausman, B.L. 2003. *Mother's milk: Breastfeeding controversies in American culture*. New York: Routledge.

Hegar, B., Dewanti, N.R., Kadim, M., Alatas, S., Firmansyah, A., & Vandenplas, Y. 2009. Natural evolution of regurgitation in healthy infants. *Acta Pædiatrica*, 98(7), 1189-1193.

Heinzmann, A., Brugger, M., Engels, C., Prömpler, H., Superti-Furga, A., Strauch, K., & Krueger, M. 2009. Risk factors of neonatal respiratory distress following vaginal delivery and caesarean section in the German population. *Acta Pædiatrica*, 98(1), 25-30.

Heird, W.C. The role of polyunsaturated fatty acids in term and preterm infants and breastfeeding mothers. *Pediatric Clinics of North America*, 48(1), 173-188.

Hemminki, E. 2006. Why do women go along with this stuff? (Roundtable) *Birth*, 33(2), 157-158.

Hendrie, C., Mannion, H., Godfrey, G., Cavanagh, C., & Sharpe, C. 2008. Ethological evidence to show that nightclubs are human display grounds (Abstract). *International Society for Human Ethology Conference XIX*, 42-43.

Heritier, S.R., Gebski, V.J., & Keech, A.C. 2003 Inclusion of patients in clinical trial analysis: The intention-to-treat principle. *Medical Journal of Australia*, 179(8), 438-440.

Higley, E. & Dozier, M. 2009. Nighttime maternal responsiveness and infant attachment at one year. *Attachment & Human Development*, 11(4), 347-363.

Hoeyer, K., Dahlager, L., & Lynöe, N. 2005. Conflicting notions of research ethics: The mutually challenging traditions of social scientists and medical researchers. *Social Science & Medicine*, 61(8), 1741-1749.

Hofer, M.A. 1978. Hidden regulatory processes in early social relationships. In Bateson, P.P.G & Klopfer, P.H. (Eds.). *Perspectives in Ethology* (Vol. 3) (135-166). Plenum Publishing Corporation.

Hohman, Z. & Figeredo, A.J. 2008. Using the human affect ethogram to compare the Gottman and Ekman models of emotion (Abstract). *International Society for Human Ethology Conference XIX*, 34-35.

Horta, B.L., Bahln, R., Martines, J.C., & Victora, C.G. 2007. *Evidence on the long-term effects of breastfeeding: Systematic reviews and meta-analyses*. Geneva: World Health Organization. Accessed October 2008 at http://whqlibdoc.who.int/publications/2007/9789241595230_eng.pdf.

Hospital Episode Statistics (HES) 2009. *Maternity data*. London: The Information Centre. Accessed July 2009 at http://www.hesonline.nhs.uk/Ease/servlet/ContentServer?siteID=1937&categoryID=1009.

Howie, W.O. & McMullen, P.C. 2006. Breastfeeding problems following anesthetic administration. *Journal of Perinatal Education*, 15(3), 50-57.

Hrdy, S.B. 1992. Fitness tradeoffs in the history and evolution of delegated mothering with special reference to wet-nursing, abandonment, and infanticide. *Ethology & Sociobiology*, 13(5-6), 409-442.

----- 1999. *Mother nature: Maternal instincts and how they shape the human species*. New York: Ballatine Books.

Jab, A.H. 2004. Fetal lung development. In Creasy, R.K., Resnik, R., & Iams, J.D. (Eds.). *Maternal-fetal medicine: Principles and practice* (5th ed.). Philadelphia: Saunders.

Jadad, A.R. & Enkin, M.W. 2007. *Randomized controlled trials: Questions, answers and musings* (2nd ed.). Oxford: Blackwell Publishing.

Jain, L. & Eaton, D.C. 2006. Physiology of fetal lung fluid clearance and the effect of labor. *Seminars in Perinatology*, 30(1), 34-43.

Jain, N.J., Kruse, L.K., Demissie, K., & Khandelwal, M. 2009. Impact of mode of delivery on neonatal complications: Trends between 1997 and 2005. *The Journal of Maternal, Fetal & Neonatal Medicine,*22(6), 491-500.

Jasienska, G. 2009. Reproduction and lifespan: Trade-offs, overall energy budgets, intergenerational costs, and costs neglected by research. *American Journal of Human Biology*, 21(4), 524-532.

Jelliffe, D.B. & Jelliffe, E.F.P. 1978. *Human milk in the modern world: Psychological, nutritional, and economic significance*. Oxford: Oxford University Press.

Jenni, O.G. & O'Connor, B.B. 2005. Children's sleep: An interplay between culture and biology. *Pediatrics*, 115(1), 204-216.

Johnson, M.H. & Everitt, B. 2000. *Essential reproduction* (5th ed.). London: Blackwell Science Ltd.

Jones, G., Steketee, R., Black, R., Bhutta, Z., & Morris, S. 2003. How many child deaths can we prevent this year? *The Lancet*, 362(9377), 65-71.

Jordan, B. 1993. *Birth in four cultures: A crosscultural investigation of childbirth in Yucatan, Hollans, Sweden, and the United States* (4th ed.). Prospect Heights, IL: Waveland Press Incorporated.

----- 1997. Authoritative knowledge and its construction. In Davis-Floyd, R.E. & Sargent, C.F. (Eds.). *Childbirth and authoritative knowledge: Cross-cultural perspectives* (55-79). Berkeley: University of California Press.

Jordan, S., Emery, S., Bradshaw, C., Watkins, A., & Friswell, W. 2005. The impact of intrapartum analgesia on infant feeding. *BJOG: An International Journal of Obstetrics & Gynaecology*, 112(7), 927-934.

Jurmain., R., Nelson, H., Kigore, L., & Trevathan, W.R. 2008. *Introduction to physical anthropology* (11th ed.). Belmont, CA: Thomson Wadsworth.

Kalish, R.B., McCullough, L.B., & Chervenak, F.A. 2008. Patient choice cesarean delivery: Ethical issues. *Current Opinion in Obstetrics & Gynecology*, 20(2), 116-119.

Karlström, A., Engström-Olofsson, R., Norbergh, K-G., Sjöling, M., & Hildingsson, I. 2007. Postoperative pain after cesarean birth affects breastfeeding and infant care. *Journal of Obstetric, Gynecologic, & Neonatal Nursing*. 36(5), 430-440.

Kattwinkel, J., Hauck, F.R., Keenan, M.E., Malloy, M., & Moon, R.Y. 2005. The changing concept of sudden infant death syndrome: Diagnostic coding shifts, controversies regarding the sleeping environment, and new variables to consider in reducing risk. *Pediatrics*, 116(5), 1245-1255.

Keefe, M.R. 1988. The impact of infant rooming-in on maternal sleep at night. *Journal of Obstetric, Gynecologic, & Neonatal Nursing*, 17(2), 122-126.

Keller, M.C., Nesse, R.M., & Hofferth, S. 2001. The Trivers-Willard hypothesis of parental investment: No effect in the contemporary United States. *Evolution & Human Behavior*, 22(5), 343-360.

Kemp, J.S., Nelson, V.E., & Thach, B.T. 1994. Physical properties of bedding that may increase risk of sudden infant death syndrome in prone-sleeping infants. *Pediatric Research*, 36(1), 7-11.

Kirchengast, S. & Hartmann, B. 2003. Nicotine consumption before and during pregnancy affects not only newborn size but also birth modus. *Journal of Biosocial Science*, 35(2), 175-188.

Kitterman, J.A., Ballard, P.L., Clements, C.A., Mescher, E.J., & Tooley, W.H. 1979. Tracheal fluid in fetal lambs: Spontaneous decrease prior to birth. *Journal of Applied Physiology*, 47(5), 985-989.

Kitzinger, S. 2006. *Birth crisis*. London: Routledge.

Kjaergaard, H., Foldgast, A.M., & Dykes, A.K. 2007. Experiences of non-progressive and augmented labour among nulliparous women: A qualitative interview study in a Grounded Theory approach. *BMC Pregnancy & Childbirth*, 7, 15. doi:10.1186/1471-2393-7-15.

Klaus, M.H. & Kennell, J.H. 1976. *Maternal-infant bonding: The impact of early separation or loss on family development*. St. Louis, MO: The C.V. Mosby Company.

Klingaman, K.P., Volpe, L.E., & McKenna, J.J. 2005. Human infant sleep locations as determined by adolescent and adult primiparous mothers (Abstract). *American Journal of Physical Anthropology*. S40, 131.

Kotch, J.B. 1997. Research ethics. In Kotch, J.B. (Ed.). *Maternal and child health: Programs, problems, and policy in public health* (387-391). Gaithersburg, Maryland: Aspen Publishers.

Kramer, M.S. & Kakuma, R. 2001. *The optimal duration of exclusive breastfeeding: A systematic review*. Geneva: World Health Organization. Accessed July 2009 at http://whqlibdoc.who.int/hq/2001/WHO_NHD_01.08.pdf.

Kreger, D.C. 2008. *Homo erectus*. Accessed October 2008 at http://www.archaeologyinfo.com/homoerectus.htm.

Kroeger, M. 2004. *Impact of birthing practices on breastfeeding: Protecting the mother and baby continuum*. Sudbury, MA: Jones and Bartlett.

Kuzawa, C.W. 2008. The developmental origins of adult health: Intergenerational inertia in adaptation and disease. In Trevathan, W.R., Smith, E.O., & McKenna, J.J. (Eds.). *Evolutionary medicine and health: New perspectives* (325-349). Oxford: Oxford University Press.

Kvale, S. 1996. *Interviews: An introduction to qualitative research interviewing*. Thousand Oaks, CA: Sage.

Labbok, M. 2001. Effects of breastfeeding on the mother. *Pediatric Clinics of North America*, 48(1), 143-158.

Labbock, M.H., Clark, D., & Goldman, A.S. 2004. Breastfeeding: Maintaining an irreplaceable immunological resource. *Nature Reviews: Immunology*, 4(7), 565-572.

Lagercrantz, H. & Slotkin, T.A. 1986 (April). The "stress" of being born. *Scientific American*, 254(4), 100-107.

La Leche League International. 2004. *The womanly art of breastfeeding* (7th ed.). New York: Plume.

Lalor, J., Begley, C.M., & Galavan, E. 2009. Recasting Hope: A process of adaptation following fetal anomaly diagnosis. *Social Science & Medicine*, 68(3), 462-472.
Lancaster, J.B. 1993. The evolutionary biology of women. In Almquist, A.J. & Manyak, A. (Eds.). Milestones in human evolution (21-37). Prospect Heights, IL: Waveland Press.
Landon, M.B. 2008. Vaginal birth after cesarean section. *Clinics in Perinatology*, 35(3), 491-504.
Laursen, M., Hedegaard, M., & Johansen, C. 2008. Fear of childbirth: Predictors and temporal changes among nulliparous women in the Danish National Birth Cohort. *Epidemiology*, 115(3), 354-360.
Lavender, T., Baker, L., Smyth, R., Collins, S., Spofforth, A., & Dey, P. 2005. Breastfeeding expectations versus reality: A cluster randomised controlled trial. *BJOG: An International Journal of Obstetrics & Gynaecology*, 112(8), 1047-1053.
Lawrence, R.A. & Lawrence, R.M. 2005. *Breastfeeding: A guide for the medical profession* (6th ed.). Philadelphia: Elsevier Mosby.
Leap, N. 2009. Woman-centred or women-centred care: Does it matter? *British Journal of Midwifery*, 17(1), 12-16.
Lee, K. 2000. Crying and behavior pattern in breast- and formula-fed infants. *Early Human Development*, 58(2), 133-140.
Leech, S. 2006. *Parent infant sleep synchrony: A test of two infant sleep locations*. Master of Science dissertation, Durham University.
Leitch, C.R. & Walker, J.J. 1998. The rise in cesarean section rate: The same indications but a lower threshold. *Obstetrical & Gynecological Survey*, 54(1), 19-20.
Leonard, W.R. & Robertson, M.L. 1997. Rethinking the energetics of bipedality. *Current Anthropology*, 38(2), 304-309.
Li, R., Scanlon, K., & Serdula, M.K. 2008. The validity and reliability of maternal recall of breastfeeding practice. *Nutrition Reviews*, 63(4), 103-110.
Lin, C-H., Kuo, S-C., Lin, K-C., & Chang, T-Y. 2007. Evaluating effects of prenatal breastfeeding education programme on women with caesarean delivery in Taiwan. *Journal of Clinical Nursing*, 17(21), 2838-2845.
Lin, S-S., Chien, L-Y., Tai, C-J., & Lee, C-F. 2008. Effectiveness of a prenatal education programme on breastfeeding outcomes in Taiwan. *Journal of Clinical Nursing*, 17(3), 296-303.
Lissauer, T. & Clayden, G. 2001. *Illustrated textbook of paediatrics* (2nd ed.). London: Mosby.
Liston, F.A., Allen, V.M., O'Connell, C.M., & Jangaard, K.A. 2008. Neonatal outcomes with caesarean delivery at term. *Archives of Disease in Childhood – Fetal & Neonatal Edition*, 93(3), F176-F182.
Lozoff, B., Brittenham, G.M., Trause, M.A., Kennell, J.H., & Klaus, M.H. 1977. The mother-newborn relationship: Limits of adaptability. *Pediatrics*, 91(1), 1-12.
Lucas, D.N., Yentis, S.M., Kinsella, S.M., Holdcroft, A., May, A.E., Wee, M., & Robinson, P.N. 2000. Urgency of caesarean section: A New classification. *Journal of the Royal Society of Medicine*, 93(7), 346-350.
Lumley, J. 1985. Assessing satisfaction with childbirth. *Birth,* 12(3), 141-145.
Lyu, L-C., Lo, C-C., Chen, H-F., Wang, C-Y., & Liu, D-M. 2009. A prospective study of dietary intakes and influential factors from pregnancy to postpartum on maternal weight retention in Taipei, Taiwan. *British Journal of Nutrition*, doi:10.1017/S000711450999124.
MacLean, L.M., Meyer, M., & Estable, A. 2004. Improving accuracy of transcripts in qualitative research. *Qualitative Health Research*, 14(1), 113-123.

Madden, J.D., Boyar, R.M., MacDonald, P.C., & Porter, J.C. 1997. Analysis of secretary patterns of prolactin and gonadotropins during twenty-four hours in a lactating woman before and after resumption of menses. *American Journal of Obstetrics & Gynecology*, 132, 436-441.

Mancuso, M.S. & Rouse, D.J. 2008. Cesarean delivery for abnormal labor. *Clinics in Perinatology*, 35(3), 479-490.

Mander, R. 2007. *Caesarean: Just another way of birth?* New York: Routledge.

Martin, E. 1991. *The woman in the body: A cultural analysis of reproduction*. Boston: Beacon Press.

Martin, J. & Marker, D.A. 2007. Informed consent: Interpretations and practice on social surveys. *Social Science & Medicine*, 65(11), 2260-2271.

Martin, P. & Bateson, P. 1993. *Measuring behaviour* (2nd ed.). Cambridge: Cambridge University Press.

Martin, R.D. 1983. *Human brain evolution in an ecological context*. 52nd James Arthur Lecture on the evolution of the human brain. New York: American Museum of Natural History.

----- 2007. The evolution of human reproduction: A primatological perspective. *Yearbook of Physical Anthropology*, 50(S45), 59-84.

Mathur, G.P., Pandey, P.K, Mathur, S., Sharma, S., Agnihotri, M., Bhalla, M., & Bhalla, J.N. 1993. Breastfeeding in babies delivered by cesarean section. *Indian Pediatrics*, 30(11), 1285-1290.

McCoy, R.C., Hunt, C.E., Lesko, S.M., Richard, V., Corwin, M.J., Willinger, M., Hoffman, H.J., & Mitchell, A.A. 2004. Frequency of bed sharing and its relationship to breastfeeding. *Journal of Developmental & Behavioral Pediatrics*, 25(3), 141-149.

McCoy, R.C., McKenna, J.J., Gartner, L., Chantry, C.J., Howard, C.R., Lawrence, C.R., Marinelli, K.A., & Powers, N.G. 2008. Academy of Breastfeeding Medicine Clinical Protocol #6: Guideline on co-sleeping and breastfeeding. *Breastfeeding Medicine*, 3(1), 38-43.

McDade, T.W. & Worthman, C.M. 1998. The weanling's dilemma reconsidered: A biocultural analysis of breastfeeding ecology. *Developmental & Behavioral Pediatrics*, 19(4), 286-299.

McIntire, D.D., Bloom, S.L., Casey, B.M., & Leveno, K.L. 1999. Birth weight in relation to morbidity and mortality among newborn infants. *New England Journal of Medicine*, 340(16), 1234-1238.

McKenna, J.J. 2001. Why we never ask "Is it safe for infants to sleep alone?" Historical origins of scientific bias in the bedsharing SIDS/SUDI 'debate.' *Breastfeeding Medicine*, 7(4), 32 & 38.

McKenna, J.J., Ball, H.L., & Gettler, L.T. 2007. Mother-infant co-sleeping, breastfeeding and sudden infant death syndrome: What biological anthropology has discovered about normal infant sleep and pediatric sleep medicine. *Yearbook of Physical Anthropology*, 50(Suppl. 45), 133-161.

McKenna, J.J. & McDade, T. 2005. Why babies should never sleep alone: A review of the co-sleeping controversy in relation to SIDS, bedsharing and breastfeeding. *Paediatric Respiratory Reviews*, 6(2), 134-152.

McKenna, J.J. & Mosko, S. 2001. Mother-infant cosleeping: Toward a new scientific beginning. In Byard, R. & Krous, H. (Eds.). *Sudden infant death syndrome: Problems, progress, possibilities* (259-272). New York: Arnold Publishers.

McKenna, J.J., Mosko, S., Dungy, C., & McAininch, D. 1990. Sleep and arousal patterns of co-sleeping human mother/infant pairs: A preliminary physiological study with implications for the study of sudden infant death syndrome (SIDS). *American Journal of Physical Anthropology*, 83(3), 31-347.

McKenna, J.J., Mosko, S.S., & Richard, C.A. 1997. Bedsharing promotes breastfeeding. *Pediatrics*, 100(2), 214-219.

McKenna, J.J., Thoman, E.B., Anders, T.F., Sadeh, A., Schechtman, V.L., & Glotzbach, S.F. 1993. Infant-parent co-sleeping in an evolutionary perspective: Implications for understanding infant sleep development and the sudden infant death syndrome. *Sleep*, 16(3), 263-282.

McMillan, B., Conner, M., Green, J., Dyson, J., Renfrew, M., & Woolridge, M. 2009. Using an extended theory of planned behaviour to inform interventions aimed at increased breastfeeding uptake in primiparas experiencing maternal deprivation. *British Journal of Health Psychology*, 14(2), 379-403.

Mead, M. 1956. *New lives for old.* New York: William Morrow.

Meek, J.Y. & Tippins, S. 2002. *American Academy of Pediatrics new mother's guide to breastfeeding*. New York: Bantam Books.

Melton, L., Bryant, S., Wahner, H., O'Fallon, W.M., Malkasian, G.D., Judd, H.L., & Riggs, B.L. 1993. Influence of breastfeeding and other reproductive factors in bone mass later life. *Osteoporosis International*, 3(2), 76-83.

Mendenhall, W., Beaver, R.J., & Beaver, B.M. 2009. *Introduction to probability and statistics* (13th ed.). Belmont, CA: Brooks/Cole.

Menella, J.A., Yourshaw, L.M., & Morgan, L.K. 2007. Breastfeeding and smoking: Short-term effects on infant feeding and sleep. *Pediatrics*, 120(3), 497-502.

Merchant, C. 1980. *The death of nature: Women, ecology and the scientific revolution*. San Franciso: Harper & Row Publishers.

Merten, S., Dratva, J., & Ackermann-Leibrich, U. 2005. Do baby-friendly hospitals influence breastfeeding duration at a national level? *Pediatrics*, 116(5), e702-e708.

Miller, T. & Boulton, M. 2007. Changing constructions of informed consent: Qualitative research and complex social worlds. *Social Science & Medicine*, 65(11), 2199-2211.

Miracle, D.J. & Fredland, V. 2007. Provider encouragement of breastfeeding: Efficacy and ethics (Commentary). *Journal of Midwifery & Women's Health*, 52(6), 545-548.

Mizuno, K., Fujimaki, K., & Sawada, M. 2004. Sucking behavior at breast during the early newborn period affects later breast-feeding and duration of breast-feeding. *Pediatrics International*, 46(1), 15-20.

Moher, D., Schulz, K.F., & Altman, D.G. 2001. The CONSORT statement: Revised recommendations for improving the quality of reports of parallel-group randomised trials. *The Lancet*, 357(9263), 1191-1194.

Molyneux, C.S., Peshu, N., & Marsh, K. 2005. Trust and informed consent: Insights from community members on the Kenyan coast. *Social Science & Medicine*, 61(7), 1463-1473.

Montagu, A. 1986. *Touching: The human significance of the skin*. New York: Harper & Row Publishers.

Montgomery, A., Hale, T.W., & The Academy of Breastfeeding Medicine Protocol Committee. 2006. ABM Clinical Protocol #15: Analgesia and anesthesia for the breastfeeding mother. *Breastfeeding Medicine*, 1(4), 271-277.

Moon, R., Horne, R.S.C., & Hauck, F.R. 2007. Sudden infant death syndrome. *The Lancet*, 370(9598), 1578-1587.

Moore, E.R., Anderson, G.C., & Bergman, N. 2007. Early skin-to-skin contact for mothers and their healthy newborn infants. *Cochrane Database Systematic Review*, 18(3), CD003519.

Morris, N. & Bàlmer, B. 2006. Volunteer human subjects' understandings of their participation in a biomedical research experiment. *Social Science & Medicine*, 62(4), 998-1008.

Morrison, B., Ludington-Hoe, S., & Anderson, G.C. 2006. Interruptions to breastfeeding dyads on postpartum day 1 in a university hospital. *Journal of Obstetric, Gynecologic, & Neonatal Nursing*, 35(6), 709-716.

Morse, J.M. 2005. Beyond the clinical trial: Expanding criteria for evidence. *Qualitative Health Research*, 15(1), 3-4.
Mosko, S., Richard, C.A., & McKenna, J.J. 1997. Infant arousals during mother-infant bed sharing: Implications for infant sleep and sudden infant death syndrome. *Pediatrics*, 100(5), 841-849.
Murray, E.K., Ricketts, S., & Dellaport, J. 2007. Hospital practices that increase breastfeeding duration: Results from a population-based study. *Birth*, 34 (3), 202-211.
Murthy, D. 2008. Digital ethnography: An examination of the use of new technologies for social research. *Sociology*, 42(5), 837-855.
Nakao, Y., Moji, K., Honda, S., & Oishi, K. 2008. Initiation of breastfeeding within 120 minutes after birth is associated with breastfeeding at four months among Japanese women: A self-administered questionnaire survey. *International Breastfeeding Journal*, 3, 1. doi:10.1186/1746-4358-3-1.
National Institute for Health and Clinical Excellence (NICE). 2004. *Caesarean section*. London: Royal College of Obstetricians and Gynaecologists Press.
Nesse, R.M. 2008a. Evolution: Medicine's most basic science. *The Lancet*, 372(S1), S21-S27.
----- 2008b. The importance of evolution for medicine. In Trevathan, W.R., Smith, E.O., & McKenna, J.J. *Evolutionary medicine and health: New perspectives* (416-433). Oxford: Oxford University Press.
Nesse, R.M. & Williams, G.C. 1994. *Why we get sick: The new science of Darwinian medicine*. New York: Vintage Books.
Neville, M.C. 2001. Anatomy and physiology of lactation. *Pediatric Clinics of North America*, 48(1), 13-34.
Neville, M.C., Morton, J., & Umemura, S. 2001. Lactogenesis: The transition from pregnancy to lactation. *Pediatric Clinics of North America*, 41(1), 35-52.
Nissen, E., Uvnäs-Moberg, K., Svensson, K., Stock, S., Widström, A-M., & Winberg, J. 1996. Different patterns of oxytocin, prolactin but not cortisol release during breastfeeding in women delivered by caesarean section or by the vaginal route. *Early Human Development*, 45(1-2), 103-118.
Nolan, A. & Lawrence, C. 2009. A pilot study of a nursing intervention protocol to minimize maternal-infant separation after cesarean birth. *Journal of Obstetric, Gynecologic, & Neonatal Nursing*, 38(4), 430-442.
Nommsen-Rivers, L.A. & Dewey, K.G. 2009. Development and validation of the infant feeding intentions scale. *Maternal & Child Health Journal*, 13(3), 334-342.
Novak, B.V. 2005. Adaptation to extrauterine life – respiration and cardiovascular functions. In Stables, D. & Rankin, J. (Eds.). *Physiology in childbearing* (2nd ed.) (607-621). London: Elsevier.
Núñez-de la Mora, A. & Bentley, G.R. 2008. Early life effects on reproductive function. In Trevathan, W.R., Smith, E.O., & McKenna, J.J. (Eds.). *Evolutionary medicine and health: New perspectives* (149-168). Oxford: Oxford University Press.
Nuremberg code. 1949. *Trials of War Criminals before the Nuremberg Military Tribunals under Control Council Law*. 10(2), 181-182. Washington, D.C.: United States of America Government Printing Office. Accessed October 2008 at http://history.nih.gov/laws/pdf/nuremberg.pdf.
Nyström, K. & Ohrling, K. 2004. Parenthood experiences during the child's first year: Literature review. *Journal of Advanced Nursing*, 46(3), 319-330.
O'Brien, M.L., Buikstra, E., Fallon, T., & Hegney, D. 2009. Strategies for success: A toolbox of coping strategies used by breastfeeding women. *Journal of Clinical Nursing*, 18(11), 1574-1582.
Odent, M. 2003. *Birth and breastfeeding: Rediscovering the needs of women during pregnancy and childbirth*. Forest Row, England: Clairview.

----- 2004. *The caesarean*. London: Free Association Books.
O'Dowd, M.J. & Philip, E.E. 2000. *The history of obstetrics and gynaecology*. London: The Parthenon Publishing Group.
Oftedal, O.T. 2002a. The mammary gland and its origin during synapsid evolution. *Journal of Mammary Gland Biology & Neoplasia*, 7(3), 225-252.
----- 2002b. The origin of lactation as a water source for parchment-shelled eggs. *Journal of Mammary Gland Biology & Neoplasia*, 7(3), 253-266.
Omari, T. & Rudolph, C.D. 2004. Gastrointestinal motility. In Polin, R.A., Fox, W.W., & Abman, S.H. (Eds.). *Fetal and neonatal physiology* (3rd ed.). Philadelphia: Saunders.
Orzalesi, M.M., Motoyama, E.K., Jacobson, H.N., Yikkawa, Y., Reynolds, E.O.R., & Cook, C.D. 1965. The development of the lung of lambs. *Pediatrics*, 35(3), 373-381.
Otamiri, G., Berg, G., Ledin, T., Leijon, I., & Lagercrantz, H. 1991. Delayed neurological adaptation in infants delivered by elective cesarean section and the relation to catecholamine levels. *Early Human Development*, 26(1), 51-60.
Panter-Brick, C. & Fuentes, A. 2008. Health, risk, and adversity: A contextual view from anthropology. 2008. In Panter-Brick, C. & Fuentes, A. (Eds.). *Health, risk, and adversity* (13-25). Oxford: Berghahn Books.
Patel, R.R., Liebling, R.E., & Murphy, D.J. 2003. Effect of operative delivery in the second stage of labor on breastfeeding success. *Birth*, 30(4), 255-260.
Pérez-Ríos, N., Ramos-Valencia, G., & Ortiz, A.P. 2008. Cesarean delivery as a barrier for breastfeeding initiation: The Puerto Rican experience. *Journal of Human Lactation*, 24(3), 293-302.
Peters, C., Becher, J.C., Lyon, A.J., & Midgley, P. 2009. Who is blaming the baby? *Archives of Disease in Childhood*, doi:10.1136/adc.2008.143628.
Philipp, B.L., Merewood, A., Miller, L.W., Chawla, N., Murphy-Smith, M.M., Gomes, J.S., Cimo, S., & Cook, J.T. 2001. Baby-friendly hospital initiative improves breastfeeding initiation rates in a US hospital setting. *Pediatrics*, 108(3), 677-681.
Phillips, V. 1993. Relactation in mothers of children over 12 months. *Journal of Tropical Pediatrics*, 39(1), 45-48.
Picciano, M.F. 2001. Nutrient composition of human milk. *Pediatric Clinics of North America*, 48(1), 53-67.
Pollard, T.M. 2007. Adrenaline. In Fink, G. (Ed.). *The Encyclopedia of stress*. (60-64). Oxford: Elsevier.
Pollard, T.M. & Unwin, N. 2008. Impaired reproductive function in women in western and "westernizing" populations: An evolutionary approach. In Trevathan, W.R., Smith, E.O., & McKenna, J.J. (Eds.). *Evolutionary medicine and health: New perspectives* (169-180). Oxford: Oxford University Press.
Pond, 1977. The significance of lactation in the evolution of mammals. *Evolution*, 31(1), 177-199.
Portmann, A. 1941. Die tragzeiten der primaten und die dauer der schwangerschaft beim menschen: Ein problem der vergleichenden. *Biologie. Rev Suisse Zool*. 48, 511–518.
Potter, J.E., Hopkins, K., Faúndes, A., & Perpétuo, I. 2008. Women's autonomy and scheduled cesarean sections in Brazil: A cautionary tale. *Birth*, 35(1), 33-40.
Prentice, A.M. & Prentice, A. 1995. Evolutionary and environmental influences on human lactation. *Proceedings of the Nutrition Society*, 54(2), 391-400.
Profet, M. 1992. Pregnancy sickness as adaptation: A deterrent to maternal ingestion of teratogens. In Barkow, J.E., Cosmides, L., & Tooby, J. (Eds.). *The adapted mind: Evolutionary psychology and the generation of culture* (327-365). Oxford: Oxford University Press.

Quandt, S.A. 1981. *The biobehavioral dynamics of the infant feeding process*. Doctor of Philosophy thesis, Michigan State University.
----- 1995. Sociocultural aspects of the lactation process. In Stuart-Macadam, P. & Dettwyler, K.A. (Eds.). *Breastfeeding: Biocultural perspectives* (127-143). New York: Aldine de Gruyter.
Quillin, S.I.M. & Glenn, L.L. 2004. Interaction between feeding method and co-sleeping on maternal-newborn sleep. *Journal of Obstetric, Gynecologic, & Neonatal Nursing*, 35(5), 580-588.
Quinn, M.W., de Boer, R.C., Ansari, N., & Baumer, J.H. 1998. Stress response and mode of ventilation in preterm infants. *Archives of Disease in Childhood – Fetal & Neonatal Edition*. 78(3), F195-F198.
Quiroz, L.H., Chang, H., Blomquist, J.L., Okoh, Y.K., & Handa, V.L. 2009. Scheduled cesarean delivery: Maternal and neonatal risks in primiparous women in a community hospital setting. *American Journal of Perinatology*, 26(4), 271-277.
Ramachadrappa, A. & Jain, L. 2008. Elective cesarean section: Its impact on neonatal respiratory outcome. *Clinics in Perinatology*, 35(2), 373-393.
Randell, S.H. & Young, S.L. 2004. Structure of the alveolar epithelial cells and the surface layer during development. In Polin, R.A., Fox, W.W., Abram, S.H. (Eds). *Fetal and neontatal physiology* (3rd ed.). Philadelphia: Saunders.
Rankin, J. 2005a. Breastfeeding practice and problems. In Stables, D. & Rankin, J. (Eds.). *Physiology in childbearing* (2nd ed.) (699-709). London: Elsevier.
----- 2005b. Respiration. In Stables, D. & Rankin, J. (Eds.). *Physiology in childbearing* (2nd ed.) (239-251). London: Elsevier.
----- 2005c. The breasts and lactation. In Stables, D. & Rankin, J. (Eds.). *Physiology in childbearing* (2nd ed.) (685-698). London: Elsevier.
Reddin, E., Pincombe, J., & Darbyshire, P. 2007. Passive resistance: Early experiences of midwifery students/graduate and the Baby Friendly Health Initiative 10 steps to successful breastfeeding. *Women & Birth*, 20(2), 71-76.
Reiches, M.W., Ellison, P.T., Lipson, S.F., Sharrock, K.C., Gardiner, E., & Duncan, L.G. 2009. Pooled energy budget and human life history. *American Journal of Human Biology*. 21(4), 421-429.
Renfrew, M. & Hall, D. 2008. Enabling women to breast feed (Editorial). *British Medical Journal*, 337, a1570.
Reynolds, A. 2001. Breastfeeding and brain development. *Pediatric Clinics of North America*, 48(1), 159-171.
Rice, P.L. 2000. Rooming-in and cultural practices: Choice or constraint? *Journal of Reproductive & Infant Psychology*, 18(1), 21-32.
Rigda, R.S., McMillen, I.C., & Buckley, P. 2000. Bed sharing patterns in a cohort of Australian infants during the first six months after birth. *Journal of Paediatrics & Child Health*, 36(2), 117-121.
Righard, L. & Alade, M.O. 1990. Effect of delivery room routine on success of first breastfeed. *The Lancet*, 336(8723), 1105-1107.
Riordan, J., Gross, A., Angeron, J., Krumwiede, B., & Melin, J. 2000. The effect of labor pain relief medication on neonatal suckling and breastfeeding duration. *Journal of Human Lactation*, 16(1), 7-12.
Rivier, C., Vale, W., Ling, N., Brown, M., & Guillemin, R. 1977. Stimulation in vivo of the secretion of prolactin and growth hormone by beta-endorphin. *Endocrinology*, 100(1), 238-241.
Robinson, L. 2009. *The 'Got Milk?' project: The timing of lactogenesis phase II. The impact of mother-infant proximity*. Master of Science dissertation, Durham University.
----- In progress. *Promoting breastfeeding interventions that support maternal lactation physiology*. Doctor of Philosophy thesis, Durham University.

Rodman, P.S. & McHenry, H.M. 1980. Bioenergetics and the origin of hominid bipedalism. *American Journal of Physical Anthropology*, 52(1), 103-106.
Rosenberg, K. 1992. The evolution of modern human childbirth. *Yearbook of Physical Anthropology*, 35(S15), 89-124.
Rosenberg, K. & Trevathan, W.R. 2002. Birth, obstetrics and human evolution. *BJOG: An International Journal of Obstetrics & Gynaecology*, 109(11), 1199-1206.
----- 2003 (May). The evolution of human birth. *Scientific American* (Special Edition: New Look at Human Evolution), 81-85.
Rothenberg, S.J., Chicz-DeMet, A., Schnass, L., Karchmer, S., Salinas, V., & Guzmán, L.A. 1996. Umbilical cord beta-endorphin and early childhood motor development. *Early Human Development*, 46(1-2), 83-95.
Rowe-Murray, H.J & Fisher, J.R.W. 2001. Operative intervention in delivery is associated with compromised early mother-infant interaction. *British Journal of Obstetrics& Gynaecology*, 108(10), 1068-1075.
----- 2002. Baby Friendly Hospital practices: Cesarean section is a persistent barrier to early initiation of breastfeeding. *Birth*, 29(2), 124-131.
Ruiz-Peláez, J.G., Charpak, N., & Cuervo, L.G., 2004. Kangaroo mother care, an example to follow from developing countries. *British Medical Journal*, 329(7475), 1179-1181.
Salehnejad, R. 2007. *Rationality, bounded rationality and microfoundations: Foundations of theoretical economics*. New York: Palgrave MacMillan.
Sanghavi, D.M. 1995. Epidemiology of sudden infant death syndrome (SIDS) for Kentucky infants born in 1990: Maternal, prenatal, and perinatal risk factors. *Kentucky Medical Association Journal*, 93(7), 286-290.
Santos, I.S., Mota, D.M., Matjasevich, A., Barros, A.J.D., & Barros, F.C.F. 2009. Bed-sharing at 3 months and breast-feeding at 1 year in Southern Brazil. *Journal of Pediatrics,* doi:10.1016/j.jpeds.2009.04.037.
Saxena, S. & Lyons, G.R. 2002. The National Sentinel caesarean section audit in the UK. *International Journal of Obstetric Anesthesia*, 11(4), 270-274.
Scheper-Hughes, N. 1992. *Death without weeping: The violence of everyday life in Brazil*. Berkeley: University of California Press.
Schiebinger, L.L. 1993. *Nature's body: Gender in the making of modern science*. Boston: Beacon Press.
Schiff, E., Cohen, S.B., Dulitzky, M., Novikov, I., Friedman, S.A., Mashiach, S., & Lipitz, S. 1998. Progression of labor in twin versus singleton gestations. *American Journal of Obstetrics & Gynecology*, 179(5), 1181-1185.
Schilinzig, T., Johansson, S., Gunnar, A., Ekström, T.J., & Norman, M. 2009. Epigenetic modulation at birth – altered DNA-methylation in white blood cells after caesarean section. *Acta Pædiatrica*, 98(7), 1096-1099.
Schimpf, M. & Tulikangas, P. 2005. Evolution of the female pelvis and relationships to pelvic organ prolapse. *International Urogynecology Journal*, 16(4), 315-320.
Scott, J.A., Binns, C.W., Graham, K.I., & Oddy, W.H. 2006. Temporal changes in the determinants of breastfeeding initiation. *Birth*, 33(1), 37-45.
Sellen, D.W. 2007. Evolution of infant and young child feeding: Implications for contemporary public health. *Annual Review of Nutrition*, 27, 123-148.
Shen, C-M., Lin, S-C., Niu, D-M., & Kou, Y.R. 2009. Labour increases the surface expression of two toll-like receptors in the cord blood monocytes of health term newborns. *Acta Pædiatrica*, 98(6), 959-962.
Siegel, S. & Castellan, N.J. 1988. *Nonparametric statistics for the behavioural sciences* (2nd ed.). New York: McGraw-Hill.
Silverman, D. 2004. Who cares about experience? Missing issues in qualitative research. In Silverman, D. (Ed.). *Qualitative research: Theory, method and practice* (2nd ed.) (342-367). London: Sage Publications.

Silvers, K.M., Frampton, C.M., Wickens, K., Epton, M.J., Pattemore, P.K., Ingham, T., Fishwick, D., Crane, J., & Town, G.I. 2009. Breastfeeding protects against adverse respiratory outcomes at 15 months of age. *Maternal & Child Nutrition*, 5(3), 243-250.

Sloman, J. & Wride, A. 2009. *Economics* (7th ed.). Harlow, England: Pearson Education Limited.

Smale, M., Renrew, M.J., Marshall, J.L., & Spiby, H. 2006. Turning policy into practice: More difficult than it seems. The case of breastfeeding education. *Maternal & Child Nutrition*, 2(2), 103-113.

Smith, L. 2004. Physics, forces, and mechanical effects of birth on breastfeeding. In Kroeger, M. *Impact of birthing practices on breastfeeding: Protecting the mother and baby continuum*. Sudbury, MA: Jones and Bartlett Publishers.

Smith, R. 2007. Parturition. *New England Journal of Medicine*, 356(3), 271-283.

Snowdon, C., Elbourne, D., & Garcia, J. 1999. Zelen randomization: Attitudes of parents participating in a neonatal clinical trial. *Controlled Clinical Trials*, 20(2), 149-171.

Sözmen, M. 1992. Effects of early suckling of cesarean-born babies on lactation. *Biology of the Neonate*, 62(1), 67-68.

Spatz, D.L. & Pugh, L.C. 2007. The integration of the use of human milk and breastfeeding in baccalaureate nursing curricula. *Nursing Outlook*, 55(5), 257-263.

Spiby, H., McCormick, F., Wallace, L., Renfrew, M.J., D'Souza, L., & Dyson, L. 2009. A systematic review of education and evidence-based practice interventions with health professionals and breast feeding counsellors on duration of breast feeding. *Midwifery*, 25(1), 50-61.

Stables, D. 2005. The placenta, membranes and amniotic fluid. In Stables, D. and Rankin, J. (Eds.). *Physiology in childbearing* (2nd ed.) (147-164). London: Elsevier.

Stanford, C. 2003. *Upright: The evolutionary key to becoming human.* New York: Houghton Mifflin Company.

Stephenson, J. & Imrie, J. 1998. Why do we need randomised controlled trials to assess behavioural interventions? *British Medical Journal*, 316(7131), 611-613.

Stern, J.M. & Reichlin, S. 1990. Prolactin circadian rhythm persists throughout lactation in women. *Neuroendocrinology*, 51(1), 31-36.

Stoll, K., Fairbrother, N., Carty, E., Jordan, N., Miceli, C., Vostrcil, Y., & Willihnganz, L. 2009. "It's all the rage these days:" University students' attitudes toward vaginal and cesarean birth. *Birth*, 36(2), 133-140.

Strassman, B.I. & Mace, R. 2008. Perspectives on human health and disease from evolutionary and behavioural ecology. In Stearns, S.C. & Koella, J. (Eds.). *Evolution in health and disease* (2nd ed.). (109-122). Oxford: Oxford University Press.

Strudel, K.L. 1994. Locomotor energetics and hominid evolution. *Evolutionary Anthropology*, 3(2), 42-48.

Stuart-Macadam, P. 1995. Breastfeeding in prehistory. In Stuart-Macadam, P. & Dettwyler, K.A. (Eds.). *Breastfeeding: Biocultural perspectives* (75-99). New York: Aldine de Gruyter.

Stuebe, A.M. & Schwarz, E.B. 2009. The risks and benefits of infant feeding practices for women and their children. *Journal of Perinatology*, doi:10.1038/jp.2009.107.

Svensson, K., Mattiesen, A-S., & Widström, A-M. 2005. Night rooming-in: Who decides? An example of staff influence on mother's attitude. *Birth*, 32(2), 99-106.

Swanson, V. & Power, K.G. 2005. Initiation and continuation of breastfeeding: Theory of planned behaviour. *Journal of Advanced Nursing*, 50(3), 272-282.

Tabachnick, B.G. & Fidell, L.S. 1996. *Using multivariate statistics* (3rd ed). New York: Harper Collins College Publishers.

Tappin, D., Ecob, R., & Brooke, H. 2005. Bedsharing, roomsharing, and sudden infant death syndrome in Scotland: A case-control study. *The Journal of Pediatrics*. 147(1), 32-37.

Taylor, J. & Johnson, M. 2008. How women manage fatigue after childbirth. *Midwifery*, doi:10.1016/j.midw.2008.07.004.

Taylor, C.R. & Rowntree, V.J. 1973. Running on two or four legs: Which consumes more energy? *Science*, 179, 186-187.

The Information Centre. 2008. *NHS Maternity Statistics, England: 2006-07.* Accessed July 2009 at http://www.ic.nhs.uk/statistics-and-data-collections/hospital-care/maternity/nhs-maternity-statistics-england:-2006-2007.

Thulier, D. & Mercer, J. 2009. Variables associated with breastfeeding duration. *Journal of Obstetric, Gynecologic & Neonatal Nursing*, 38(3), 259-268.

Todman, D. 2007. A history of caesarean section: From ancient world to the modern era. *Australian and New Zealand Journal of Obstetrics & Gynaecology,* 47(5), 357-361.

Tooher, R.L., Middleton, P.F., & Crowther, C.A. 2008. A thematic analysis of factors influencing recruitment to maternity and perinatal trials. *BMC Pregnancy & Childbirth*, 8(36), doi:10.1186/1471-2393-8-36

Torgerson, D.J. 2006. *Randomised controlled trials: An introduction*. Department of Health Sciences, University of York. From the Master Class in the Design and Conduct of Randomised Trials.

Torgerson, D.J. & Roberts, C. 1999. Randomisation methods: Concealment. *British Medical Journal*, 319(7206), 375-376.

Tracer, D.P. 2002. Somatic versus reproductive energy allocation in Papua New Guinea: Life history theory and public health policy. *American Journal of Human Biology*, 14(5), 621-626.

Trevathan, W.R. 1987. *Human birth: An evolutionary perspective*. New York: Aldine de Gruyter.

----- 1997. An evolutionary perspective on authoritative knowledge about birth. In Davis-Floyd, R.E. & Sargent, C.F. (Eds.). *Childbirth and authoritative knowledge: Cross-cultural perspectives* (80-88). Berkeley: University of California Press.

----- 1999. Evolutionary obstetrics. In Trevathan, W.R., Smith, E.O., & McKenna, J.J. (Eds.). *Evolutionary medicine* (407-427). New York: Oxford University Press.

----- 2007. Evolutionary obstetrics. In Nesse, R. (Ed.). *Evolution and medicine: How new applications advance research and practice*. The Biomedical & Life Sciences Collection. London: Henry Stewart Talks Limited.

Trevathan, W.R. & McKenna, J.J. 1994. Evolutionary environments of human birth and infancy: Insights to apply to contemporary life. *Children's Environments*, 11(2), 13-36.

Trevathan, W.R., Smith, E.O., & McKenna, J.J. 2008. Introduction and overview of evolutionary medicine. In Trevathan, W.R., Smith, E.O., & McKenna, J.J. (Eds.). *Evolutionary medicine and health: New perspectives* (1-54). Oxford: Oxford University Press.

Trivers, R.L. 1974. Parent-offspring conflict. *American Zoologist,* 14(1), 249-264.

Uddin, M., Goodman, M., Erez, O., Romero, R., Llu, G., Islam, M., Opazo, J.C., Sherwood, C.C., Grossman, L.I., & Wildman, D.E. 2008. Distinct genomic signatures of adaptation in pre- and postnatal environments during human evolution. *Proceedings of the National Academy of Sciences of the United States of America*, 105(9), 3215-3220.

United Kingdom Department of Health, 2009. *Reduce the risk of cot death*. Accessed August 2009 at http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_4123625.

United Nations International Children's Fund United Kingdom Baby Friendly Hospital Initiative (UNICEF UK BFHI). 2008. *Implementation guidance*. Accessed November 2008 at http://www.babyfriendly.org.uk/pdfs/implementation_guidance.pdf.

United States Department of Health and Human Services. 2000. *Healthy People 2010: Maternal, infant, and child Health*. Washington, D.C. Accessed October 2008 at http://www.healthypeople.gov/Document/pdf/Volume2/16MICH.pdf.

United States National Institutes of Health. 1982. *Cesarean childbirth* (Publication No. 82-2067). Washington, D.C.: Government Printing Office.

-----1998. *Cesarean section: A brief history*. Accessed June 2007 at http://www.nlm.nih.gov/exhibition/cesarean/.

Uvnäs-Moberg, K. & Eriksson, M. 1996. Breastfeeding: Physiological, endocrine and behavioral adaptations caused by oxytocin and local neurogenic activity in the nipple and mammary gland. *Acta Pædiatrica*, 85(5), 525-530.

Uvnäs-Moberg, K., Johansson, B., Lupoli, B., & Svennersten-Sjaunja, K. 1990. Oxytocin facilitates behavioural, metabolic and physiological adaptations during lactation. *Applied Animal Behaviour Science*, 72(3), 225-234.

Valeggia, C.R. & Ellison, P.T. 2001. Lactation, energetics and postpartum fecundity. In Ellison, P.T. (Ed.). Reproductive ecology and human evolution (85-105). New York: Aldine de Gruyter.

----- 2009. Interactions between metabolic and reproductive functions in the resumption of postpartum fecundity. *American Journal of Human Biology*, 21(4), 559-566.

Van Den Driessche, M., Peeters, K., Marien, P., Ghoos, Y., Devlieger, H., & Veereman-Wauters, G. 1999. Gastric emptying in formula-fed and breastfed infants measured with the 13C-octanoic acid breath test. *Journal Pediatric Gastroenterology & Nutrition*, 29(2), 46-51.

van Roosmalen, J. & Rosendaal, F. 2002. There is still room for disagreement about vaginal delivery of breech infants at term (Commentary). *BJOG: An International Journal of Obstetrics & Gynaecology*, 109, 967-969.

van Rossem, L., Oenema, A., Steegers, E.A.P., Moll, H.A., Jaddoe, V.W.V., Hofman, A., Mackenbach, J.P., & Raat, H. 2009. Are starting and continuing breastfeeding related to educational background? The Generation R study. *Pediatrics*, 123(6), e1017-e1027.

Venancio, S.I., Saldiva, S.R.D.M., Mondini, L., Levy, R.B., & Escuder, M.M.L. 2008. Early interruption of exclusive breastfeeding and associated factors, state of São Paulo, Brazil. *Journal of Human Lactation*, 24(2), 168-174.

Vinicius, L. 2005. Human encephalization and developmental timing. *Journal of Human Evolution*, 49(6), 762-776.

Vitzthum, V.J. 1989. Nursing behavior and its relation to duration of post-partum amenorrhoea in an Andean community. *Journal of Biosocial Science*, 21(2), 145-160.

----- 2008a. Evolution and endocrinology: The regulation of pregnancy outcomes. In Elton, S. & O'Higgins, P. (Eds.). *Medicine and Evolution: Current applications, future prospects* (99-126). London: CRC Press.

----- 2008b. Evolutionary models of women's reproductive functioning. *Annual Review of Anthropology*, 37, 53-73.

Vogl, S.E., Worda, C., Egarter, C., Bieglmayer, C., Szekeres, T., Huber, J., & Husslein, P. 2006. Mode of delivery is associated with maternal and fetal endocrine stress response. *BJOG: An International Journal of Obstetrics & Gynaecology*, 113(4), 441-445.

Voils, C.I., Sandelowski, M., Barroso, J., & Hasselbald, V. 2008. Making sense of qualitative and quantitative findings in mixed research synthesis studies. *Field Methods*, 20(1), 3-25.

Vorbach, C., Capecchi, M.R., & Penninger, J.M. 2006. Evolution of the mammary gland from the innate immune system? *BioEssays*, 28(6), 606-616.
Wake, M., Morton-Allen, E., Poulakis, Z., Hiscock, H., Gallagher, S., & Oberklaid, F. 2006. Prevalence, stability, and outcomes of cry-fuss and sleep problems in the first 2 years of life: Prospective community-based study. *Pediatrics*, 117(3), 836-842.
Waldenström, U., Hildigsson, I., & Ryding, E.L. 2006. Antenatal fear of childbirth and its association with subsequent caesarean section and experience of childbirth. *BJOG: An International Journal of Obstetrics & Gynaecology*, 113(6), 638-646.
Waldenström, U. & Swenson, A. 1991. Rooming-in at night in the postpartum ward. *Midwifery,* 7(2), 82-89.
Waletzky, L.R. & Herman, E.C. 1976. Relactation. *American Journal of Family Physicians*, 14(2), 69-74.
Walker, L.O., Sterling, B.S., & Timmerman, G.M. 2005. Retention of pregnancy-related weight in the early postpartum period: Implications for women's health services. *Journal of Obstetric, Gynecologic, & Neonatal Nursing*, 34(4), 418-427.
Walker, M. 2006. *Breastfeeding management for the clinician: Using the evidence*. Sudbury, MA: Jones and Bartlett Publishers.
Walrath, D. 2003. Rethinking pelvic typologies and the human birth mechanism. *Current Anthropology*, 44(1), 5-31.
Wambach, K., Campbell, S.H., Gill, S.L., Dodgson, J.E., Abiona,T.C., & Heinig, M.J. 2005. Clinical lactation practice: 20 years of evidence. *Journal of Human Lactation*, 21(3), 245-258.
Ward-Platt, M.P. & Ball, H.L. 2002. Rooming-in at the hospital: Assessing the practical considerations. *Mothering Magazine* (US). Accessed October 2008 at http://www.mothering.com/articles/new_baby/sleep/ward-platt.html.
Wasaka, T., Wasaka, K., Nakayama, M., Kuwae, Y., Matsuoka, K., Takeuchi, M., Suehara, N., & Kimura, T. 2009. Change in morphology and oxytocin receptor expression in the uterine blood vessels during the involution process. *Gynecologic & Obstetric Investigation*, 62(7), 137-144.
Wayse, W., Yousafzai, A., Mogale, K., & Filteau, S. 2004. Association of subclinical vitamin D deficiency with severe acute lower respiratory infection in Indian children under 5 y[ears of age]. *European Journal of Clinical Nutrition*, 58(4), 563-567.
Weaver, T.D. & Hublin, J-J. 2009. Neandertal birth canal shape and the evolution of human childbirth. *Proceedings of the National Academy of Sciences of the Untied States of America*, 106(20), 8151-8156.
Wells, J.C.K. 2003. Parent-offspring theory, signaling of need, and weight gain in early life. *The Quarterly Review of Biology*, 78(2), 169-202.
Widström, A. & Thingström-Paulsson, J. 1993. The position of the tongue during reflexes elicited in newborn infants before the first suckle*Acta Pædiatrica*, 82(3), 281-283.
Wilkinson, S. 2004. Focus group research. In Silverman, D. (Ed.). *Qualitative research: Theory, method and practice* (2nd ed.) (177-199). London: Sage Publications.
Williams, B., Entwistle, V., Haddow, G., & Wells, M. 2008. Promoting research participation: Why not advertise altruism? *Social Science & Medicine*, 66(7), 1451-1456.
Wilson, D.E. & Reeder, D.M. (Eds.). 2005. *Mammalian species of the world: A taxonomic and geographic reference* (3rd ed.). Baltimore, MA: Johns Hopkins University Press.
Winterburn, S. & Fraser, R. 2000. Does the duration of postnatal stay influence breast-feeding rates at one month in women giving birth for the first time? A randomized control trial. *Journal of Advanced Nursing*, 32(5), 1152-1157.
Wolf, J.H. 2003. Low breastfeeding rates and public health in the United States. *American Journal of Public Health*, 93(12), 2000-2010.

Wolff, H.J. 1951. *Roman law: An historical introduction*. Norman, OK: University of Oklahoma Press.
Wong, C.G. 1996. Endocrinology of the lung. In Gass, G.H. & Kaplan, H.M. (Eds.) *Handbook of endocrinology* (2nd ed.). Volume II (81-100). New York: CRC Press.
Woolridge, M.W. 1995. Baby-controlled breastfeeding: Biocultural implications. In Stuart-Macadam, P. & Dettwyler, K.A. *Breastfeeding: Biocultural perspectives (*217-242). New York: Aldine de Gruyter.
World Association of Medical Editors (WAME). 2008. *WAME publication ethics policies for medical journals*. Accessed October 2008 at http://www.wame.org/resources/publication-ethics-policies-for-medical-journals.
World Health Organization. 1985. *Appropriate technology for birth*. *The Lancet*, 2(8425), 436-437.
----- 1998. *Evidence for the ten steps to successful breastfeeding*. Geneva: World Health Organization. Accessed October 2008 at http://www.who.int/child_adolescent_health/documents/9241591544/en/.
----- 2003. *Global strategy for infant and young child feeding*. Geneva: World Health Organization. Accessed October 2008 at http://www.who.int/child_adolescent_health/documents/9241562218/en/.
----- 2006. *Pregnancy, childbirth, postpartum and newborn care: A guide for essential practice*. Geneva: World Health Organization. Accessed October 2008 at http://www.who.int/reproductivehealth/publications/maternal_perinatal_health/924159084X/en/.
----- 2007. *Priority public health conditions* (Ver. 3.1). Geneva: World Health Organization. Accessed June 2009 at http://www.who.int/social_determinants/publications/prioritypublichealthconditions/en/.
----- 2008. *Indicators for assessing infant and young child feeding practices. Part 1: Definitions*. Geneva: World Health Organization. Accessed June 2009 at http://whqlibdoc.who.int/publications/2008/9789241596664_eng.pdf.
----- 2009a. *Acceptable medical reasons for breast-milk substitutes*. Geneva: World Health Organization. Accessed September 2009 at http://www.who.int/child_adolescent_health/documents/WHO_FCH_CAH_09.01/en/.
----- 2009b. *Baby-friendly hospital initiative: Revised, updated and expanded for integrated care*. Geneva: World Health Organization. Accessed June 2009 at http://whqlibdoc.who.int/publications/2009/9789241594998_eng.pdf.
----- 2009c. *Infant and young child feeding. Model chapter for textbooks for medical students and allied health professionals*. Geneva: World Health Organization. Accessed September 2009 at http://www.who.int/nutrition/publications/infantfeeding/9789241597494/en/index.html.
Worthman, C.M. & Kuzara, J. 2005. Life history and the early origins of health differentials. *American Journal of Human Biology*, 17(1), 95-112.
Wrede, S., Benoit, C., Bourgeault, I.L., van Teijlingen, E.R., Sandall, J., & De Vries, R.G. 2006. Decentred comparative research: Context sensitive analysis of maternal health care. *Social Science & Medicine*, 63(11), 2986-2997.
Wright, C.M., Parkinson, K., & Scott, J. 2006. Breast-feeding in a UK urban context: who breast-feeds, for how long and does it matter? *Public Health Nutrition*, 9(6), 686-691.
Yamauchi, Y. & Yamanouchi, I. 1990. The relationship between rooming-in/ not rooming-in and breastfeeding variables. *Acta Pædiatrica*, 79(11), 1017-1022.

Yelland, J., Krastev, A., & Brown, S. 2009. Enhancing early postnatal care: Findings from a major reform of maternity care in three Australian hospitals. *Midwifery*, 25(4), 392-402.

Young, D. 2005. Rooming-in at night for mothers and babies: Sweden shows the way (Editorial). *Birth*, 32(3), 161-163.

Zanardo, V., Nicolussi, S., Giacomin, C., Faggian, D., Favaro, F., & Plebani, M. 2001. Beta endorphin concentrations in human milk. *Journal of Pediatric Gastroenterology & Nutrition*, 33(2), 160-164.

Zhang, J., Troendle, J.F., & Yancey, M.K. 2002. Reassesing the labor curve in nulliparous women. *American Journal of Obstetrics & Gynecology*, 187(4), 824-828.

Zuppa, A.A., Tornesello, A., Papacci, P., Tortorolo, G., Segni, G., Lafuenti, G., Moneta, E., Diodato, A., Sorcini, M., & Carta, S. 1988. Relationship between maternal parity, basal prolactin levels and neonatal breast milk intake. *Biology of the Neonate*, 53 (3), 144-147.

Zwarenstein, M., Treweek, S., Gagnier, J.J., Altman, D.G., Tunis, S., Haynes, B., Oxman, A.D., & Moher, D. 2008. Improving the reporting of pragmatic trials: An extension of the CONSORT statement. *British Medical Journal*, 337, 1-8.

Zweifel, P., Breyer, F., & Kifman, M. 2009. *Health economics* (2nd ed.). London: Springer.

Submission date 01/02/2006 Reference number 06/Q0906/4 Version 2

Participant Information Sheet

Infant care after caesarean section delivery

You are being invited to take part in a research study. Before you decide, it is important for you to understand why the research is being done and what it will involve. Please read the following information carefully and discuss it with others if you wish. Contact us anytime if there is anything that is not clear or if you would like more information.

- *PART 1 tells you the purpose of this study and what will happen to you if you take part.*
- *PART 2 gives you more detailed information about the conduct of the study.*

PART 1

WHAT IS THE PURPOSE OF THE STUDY?

We would like to learn more about how mothers care for their infants after having a caesarean section delivery.

WHY HAVE I BEEN CHOSEN?

You have had a caesarean section delivery at the Royal Victoria Infirmary. You are 18 years of age or older. You and your infant are in good health.

DO I HAVE TO TAKE PART?

No. It is up to you to decide whether or not to take part. If you do, you will be given this information sheet to keep and be asked to sign a consent form. You are still free to withdraw at any time and without giving a reason. A decision to withdraw at any time, or a decision not to take part, will not affect the standard of care you receive.

WHAT DO I HAVE TO DO?

After the birth of your infant, Kristin Klingaman will talk with you face-to-face for about thirty (30) minutes in your hospital room at the Royal Victoria Infirmary. If you prefer, the interview can be conducted over the telephone up to 3 days after hospital discharge. Questions will be about your experience and attitudes regarding infant care, especially in relation to birth and feeding. There are no right or wrong answers. We will also give you the chance to tell us any other information about your caesarean section experience that you think would be helpful for us to know.

We will need some information about your labour and delivery that we can collect from your medical records.

WHAT ARE THE POSSIBLE DISADVANTAGES AND RISKS OF TAKING PART?

Being a part of this research study involves an interview in which questions will be asked about your birthing experience. If there is a topic that you prefer not to discuss or that you find embarrassing or upsetting, you may say 'pass' when asked.

Appendix A

WHAT IF THERE IS A PROBLEM?
Please notify postgraduate research student Kristin Klingaman of any issues you would like to discuss with her. Any complaint about the way you have been dealt with during the study or any possible harm you might suffer will be addressed. The detailed information on this is given in PART 2.

WILL MY TAKING PART IN THE STUDY BE KEPT CONFIDENTIAL?
You may feel that some of this information is very personal. We consider everything you tell us to be strictly confidential and so we will protect your privacy in several ways. First, we will assign you a unique code number in order to identify all of our records for you and your infant – only members of the research staff will have access to your names and contact information. Data will be kept secure in locked file cabinets in the Parent-Infant Sleep Lab and only the researchers will have access.

When we report the results of this study, you and your child will never be named or identified.

The information you share with us will be kept confidential, unless if we receive information that we believe indicates someone is at risk.

CONTACT DETAILS

Kristin Klingaman	Helen Ball, PhD	Martin Ward Platt, MD
Durham University	Durham University	University of Newcastle
Anthropology student	Senior Lecturer in Anthropology	Senior Lecturer in Child Health
PhD candidate	Director, Parent-Infant Sleep Lab	Consultant Paediatrician
[Email address]	[Email address]	Royal Victoria Infirmary
[Telephone #]	[Telephone #]	[Email address]
		[Telephone #]

PART 2
WHAT WILL HAPPEN IF I DON'T WANT TO CARRY ON WITH THE STUDY?
You can end the interview at any time and without giving a reason.

WHAT IF THERE IS A PROBLEM?
If wish to complain, you can contact Dr. Tessa Pollard.

COMPLAINTS: Dr. Tessa Pollard, Director of Postgraduate Studies
Durham University
Department of Anthropology
[Postal address]
[Email addres]
[Telephone #]

HARM: Durham University insurance covers claims of non-negligent harm.

INVOLVEMENT OF THE GENERAL PRACTITIONER/FAMILY DOCTOR (GP)
You are encouraged to inform your GP about participation.

WHAT WILL HAPPEN TO THE RESULTS OF THE RESEARCH STUDY?
Analysis will be conducted in the Sleep Laboratory by Kristin Klingaman and Dr. Helen Ball, with a report produced by September 30, 2006.

A summary of the research results will be mailed or emailed to you by Kristin Klingaman. Findings will be made publicly available on the Durham Parent-Infant Sleep Laboratory website, http://www.dur.ac.uk/sleep.lab/.

Appendix A

WHO IS ORGANISING AND FUNDING THE RESEARCH?

This is a student project led by Kristin Klingaman of Durham University and supervised by Drs. Helen Ball and Martin Ward Platt. The researchers involved in this study have undergone a satisfactory criminal records check and health clearance. The Durham University Infancy and Childhood Research Network is helping fund this study.

WHO HAS REVIEWED THE STUDY?

This study was given a favourable ethical opinion for conduct by the Newcastle and North Tyneside Research Ethics Committee 2.

Appendix A

Submission date 04/01/2006 Reference number 06/Q0906/4 Version 2

Participant Number:

CONSENT FORM

Title of Project: **Infant care after caesarean section delivery**

Name of Researcher: Kristin Klingaman

Please initial box

☐ I confirm that I have read and understand the information sheet dated 1 February 2006 Version 2 for the above hospital (or telephone) interview study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.

☐ I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, without my medical care or legal rights being affected.

☐ I understand that relevant sections of any of my medical notes and data collected during the study, may be looked at by responsible individuals from Durham University, from regulatory authorities or from the NHS Trust, where it is relevant to my taking part in this research. I give permission for these individuals to have access to my records.

☐ I understand that I am welcome to inform my GP or others of my participation in the study.

☐ I agree to take part in the above study.

_____	_____	_____
(Print) Participant	Date	(Sign) Participant
_____	_____	_____
(Print) Researcher	Date	(Sign) Researcher

Appendix A

POSTNATAL WARD INTERVIEW

PARTICIPANT #_____DATE_____

CAESAREAN SECTION DELIVERY

Was your caesarean section scheduled before you arrived at the hospital? (how long in advance)

What reason(s) did you and/or doctors have for a caesarean operation?

Before the operation, did you understand why you were going to have a caesarean section? (did you agree with the decision?)

DEMOGRAPHIC INFORMATION

Is this the first time that you have given birth?

How many other children (have you given birth to)?

When are their birth dates?

Caesarean or vaginal (for each…and any delivery complications)?

Breastfeed? (in hospital, at discharge from hospital, home duration)

How many weeks pregnant were you when this baby was born?

Do you currently have a partner/spouse (that resides with you/ married)?

PARTICIPANT #_____DATE_____

Please check the level of schooling that you have COMPLETED:

Did not attend high school	
Attended high school	
Have high school degree	
Attended postsecondary school or university	
Have postsecondary or university degree	
Attended postgraduate study	
Have postgraduate degree (Master's)	
Have doctorate degree (PhD, MD, EdD, etc.)	
Other (please specify)	

Please check your HOUSEHOLD income over the past year:

Up to £5,000	
£5,001- £10,000	
£10,001- £15,000	
£15,001- £20,000	
£20,001- £25,000	
£25,001- £30,000	
£30,001- £35,000	
£35,001- £40,000	
£40,001- £45,000	
£45,001- £50,000	
£50,001- £55,000	
£55,001- £60,000	
£60,001- 65,000	
£65,001- 70,000	
£70,001 +	

Mother ethnicity:

Asian
Black
White European
Other (please specify)

Appendix A

PARTICIPANT #_____DATE_____

DURING THE CAESAREAN SECTION OPERATION

What type of anaesthesia were you given?

Epidural
Spinal
General
More than one type

Did you meet with the anaesthetist ahead of time (did he or she ask about how you intended to feed you baby)?

How knowledgeable did you feel about the treatment you were being given (just before, during and after the cesarean section)?

How much did you know about your baby's condition during the birth process?

During the operation, were you awake or asleep (could you see what was going on…mirror)?

Did you have a partner/ friend/ or other birth companion present in the operating theatre for the birth (was this your choice)?

PRENATAL FEEDING INTENT

What did you want (and/or plan) to feed your baby before you gave birth?

Breast milk (breastfeed or pump) use formula, or a combination of breast milk and formula

What factors influenced your feeding decision?

Did anything influence the way you are feeding your baby?

POST-OPERATIVE EXPERIENCES

Looking back, how prepared were you for the caesarean section operation?

What did you feel now (acknowledge all that apply)

Happy	
Relieved	
Well	
Tired	
Weak	
Sick	
Depressed	
Other	

Appendix A

PARTICIPANT #_____DATE_____

Was your experience better, worse, or comparable to what you expected?

Do you feel that your experience was better, worse, or comparable to most women who have undergone caesarean section delivery?

Do you feel that your experience was better, worse, or comparable to most women who delivered vaginally?

Rate pain you feel right now on a scale of one (1) to five (5), five being the most painful
1 2 3 4 5

Was your level of pain when the anaesthetic wore off less, worse, or what you expected?

Do you feel that your level of pain after the birth was less, worse, or comparable to most women who have undergone caesarean section delivery?

Do you feel that your level of pain after the birth was less, worse, or comparable to most women who delivered vaginally?

Do you feel the caesarean section was the right option for you (for your infant)?

How soon after your infant was born did you see (her or him)?

What was happening before you saw your infant (describe how you felt)?

Do you think there were any factors that influenced how you feel about your baby (in what ways)?

How did you prepare to respond to/ take care of your baby (has this changed…what factors influenced)?

Have you stood up since the operation (walked around the room)?

Has your breast milk has come in?

Do you think that there are any factors that influenced your infant's ability and/or desire to feed?

Appendix A

PARTICIPANT #_____DATE_____

Have you breastfeed or attempted to breastfeed your infant since giving birth? About how soon after the delivery? How frequently since?

Do you have any advice for women who will have caesarean section deliveries (for families…hospital staff)?

PLANS FOR AFTER DISCHARGE

Who will primarily feed your baby at home during the day….at night?

What (*breast milk, formula, combination*) do you plan to feed your infant at home during the day…at night? (for how long?)

Where do you plan for your baby to sleep at night (what factors influenced this decision)?

If you are employed outside of the home, when do you plan to return to work?

Submission date 01/02/2006 Reference number 06/Q0906/4 Version 2

PARTICIPANT INFORMATION SHEET

Infant care after caesarean section delivery – Telephone Follow-Ups

You are being invited to extend your part in a research study. Before you decide, it is important for you to understand why the research is being done and what it will involve. Please read the following information carefully and discuss it with others if you wish. Contact us anytime if there is anything that is not clear or if you would like more information.

- *PART 1 tells you the purpose of this study and what will happen to you if you take part.*
- *PART 2 gives you more detailed information about the conduct of the study.*

PART 1

WHAT IS THE PURPOSE OF THE STUDY?

We would like to learn more about how mothers care for their infants at home after having a caesarean section delivery.

WHY HAVE I BEEN CHOSEN?

You have had a caesarean section delivery. You are 18 years of age or older. You and your infant are in good health. You were pregnant with a single infant for at least thirty-seven (37) weeks (full-term). This is your first time giving birth or you did not breastfeed after leaving the hospital with any previous children.

You are feeding your baby breast milk (either breastfeeding or expressed breast milk in a bottle) on the postnatal ward at the Royal Victoria Infirmary.

DO I HAVE TO TAKE PART?

No. It is up to you to decide whether or not to take part. You can tell us not to phone if you wish end your part in the telephone interviews. You do not need to provide a reason.

WHAT DO I HAVE TO DO?

After discharge from the postnatal ward at the Royal Victoria Infirmary, a researcher will telephone you at the number you provide to talk for about fifteen (15) minutes every two weeks for a total of twelve (12) interviews. This means we will be in contact with you over the course of six (6) months. Questions will be about your experiences and attitudes regarding infant care, especially in relation to feeding, sleep and your recovery from caesarean section. There are no right or wrong answers. We will also give you the chance to tell us any other information about your caesarean section experience that you think would be helpful for us to know.

The study contributes to understanding about how mothers take care of their infants after giving birth. Parents and children will benefit from the findings, along with scientists. Your decision about whether or not to participate will not impact your care at the Royal Victoria Infirmary. You will receive £5 gift voucher after the completion of telephone interviews.

WHAT ARE THE POSSIBLE DISADVANTAGES AND RISKS OF TAKING PART?
Being a part of this research study involves an interview in which sensitive will be asked about your birthing experience. If there is a topic that you prefer not to discuss or that you find embarrassing or upsetting, you may say 'pass' when asked.

WHAT IF THERE IS A PROBLEM?
Please notify student researcher Kristin Klingaman of any issues you would like to discuss with her. Any complaint about the way you have been dealt with during the study or any possible harm you might suffer will be addressed. The detailed information on this is given in PART 2.

WILL MY TAKING PART IN THE STUDY BE KEPT CONFIDENTIAL?
You may feel that some of this information is very personal. We consider everything you tell us to be strictly confidential and so we will protect your privacy in several ways. First, we will assign you a unique code number in order to identify all of our records for you and your infant – only members of the research staff will have access to your names and contact information. Data will be kept secure in locked file cabinets in the Parent-Infant Sleep Lab and only the researchers will have access.

When we report the results of this study, you and your child will never be named or identified.

The information you share with us will be kept confidential, unless if we receive information that we believe indicates someone is at risk.

CONTACT DETAILS

Kristin Klingaman	Helen Ball, PhD	Martin Ward Platt, MD
Durham University	Durham University	University of Newcastle
Anthropology student	Senior Lecturer in Anthropology	Senior Lecturer in Child Health
PhD candidate	Director, Parent-Infant Sleep Lab	Consultant Paediatrician
[Email address]	[Email address]	Royal Victoria Infirmary
[Telephone #]	[Telephone #]	[Email address]
		[Telephone #]

PART 2

WHAT WILL HAPPEN IF I DON'T WANT TO CARRY ON WITH THE STUDY?
You can end the interview at any time and without giving a reason.

WHAT IF THERE IS A PROBLEM?
If wish to complain, you can contact Dr. Tessa Pollard.

COMPLAINTS: Dr. Tessa Pollard, Director of Postgraduate Studies
Durham University
Department of Anthropology
[Postal address]
[Email address]
[Telephone #]

HARM: Durham University insurance covers claims of non-negligent harm.

INVOLVEMENT OF THE GENERAL PRACTITIONER/FAMILY DOCTOR (GP)
You are encouraged to inform your GP about participation.

WHAT WILL HAPPEN TO THE RESULTS OF THE RESEARCH STUDY?
Analysis will be conducted in the Sleep Laboratory by Kristin Klingaman and Dr. Helen Ball, with a report produced by September 30, 2006.

Appendix B

A summary of the research results will be mailed or emailed to you by Kristin Klingaman. Findings will be made publicly available on the Durham Parent-Infant Sleep Laboratory website, http://www.dur.ac.uk/sleep.lab/.

WHO IS ORGANISING AND FUNDING THE RESEARCH?

This is a student project led by Kristin Klingaman of Durham University and supervised by Drs. Helen Ball and Martin Ward Platt. The researchers involved in this study have undergone a satisfactory criminal records check and health clearance. The Durham University Infancy and Childhood Research Network is helping fund this study.

WHO HAS REVIEWED THE STUDY?

This study was given a favourable ethical opinion for conduct by the Newcastle and North Tyneside Research Ethics Committee 2.

Appendix B

Submission date 04/01/2006 Reference number 06/Q0906/4 Version 2

Participant Number:

CONSENT FORM

Title of Project: Infant care after caesarean section delivery – telephone follow-up
Name of Researcher: Kristin Klingaman

Please initial box

☐ I confirm that I have read and understand the information sheet dated 1 February 2006 Version 2 for the above telephone interview study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.

☐ I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, without my medical care or legal rights being affected.

☐ I understand that relevant sections of any of my medical notes and data collected during the study, may be looked at by responsible individuals from Durham University, from regulatory authorities or from the NHS Trust, where it is relevant to my taking part in this research. I give permission for these individuals to have access to my records.

☐ I understand that I am welcome to inform my GP or others of my participation in the study.

☐ I agree to take part in the above study.

_____	_____	_____
(Print) Participant	Date	Signature
_____	_____	_____
(Print) Researcher	Date	Signature

Appendix B

Submission date 21/07/2006 Reference number 06/Q0905/104 Version 1

LETTER OF INVITATION TO PARTICIPATE IN RESEARCH

You and your newborn are invited to participate in a Durham University doctoral student led research project. The purpose of this study is to explore infant care after scheduled caesarean section delivery in order to improve postnatal support for mothers and newborns. The study involves interviews and an overnight video recording of you and your baby.

You are invited to participate in the study if you:

- are scheduled to deliver your baby by caesarean section at the Royal Victoria Infirmary,
- are considering breastfeeding your baby,
- are pregnant with a single baby and are expected to deliver after at least 37 weeks,
- plan to spend your entire postnatal ward stay at the Royal Victoria Infirmary,
- are 18 years of age or older, and
- did not smoke during pregnancy.

Interviews:

- Kristin will conduct 2 interviews with you on the postnatal ward - an approximately 20 minute interview on the day after your baby's birth and a 5 minute interview the morning after filming
- Kristin will also call you every few weeks over the course of 6 months to ask brief (lasting about 5 minutes) questions about caring for your infant at home
- There are no right or wrong answers. You may pass over any questions that you do not feel like answering and your responses are confidential.
- Your partner/ visitors may be present during the hospital interviews.
- A summary of responses will be provided to you at the end of the study.

Nighttime Filming:

- Your baby will be randomly assigned to spend the duration of the RVI postnatal ward stay in either the standard standalone cot in your hospital room or a side-car crib on your hospital bed. Both locations have been used previously at the RVI.
- After the first interview, Kristin will set up video equipment in your hospital room. You will be given a remote control to begin the tape once you and your baby have settled for the night. The tape will record in darkness (with a night-shot lens) for 8 hours.
- You may stop recording during the night with the remote if you change your mind about being filmed.
- You may have a copy of the video to keep.

You may change your mind and end participation in the study at any time. No reference will be made in oral or written reports that could link you to the study. Please contact Kristin Klingaman at [Telephone #] or [Email address] for more information. Thank you.

Appendix C

Submission date 25/08/2006 Reference number 06/Q0905/104 Version 2

PARTICIPANT INFORMATION SHEET

Title of project: Infant care after scheduled caesarean section delivery:
A randomised controlled trial of postnatal ward side-car cribs

Researchers: Kristin Klingaman, Dr. Helen Ball and Dr. Martin Ward-Platt

You are being invited to take part in a research study. Before you decide, it is important for you to understand why the research is being done and what it will involve. Please read the following information carefully and discuss it with others if you wish. Contact Kristin at [Telephone #] or [Email address] anytime if there is anything that is not clear or if you would like more information. Thank you.

- PART 1 tells you the purpose of the study and what will happen to you if you take part.
- PART 2 gives you more detailed information about the conduct of the study.

PART 1

WHAT IS THE PURPOSE OF THE STUDY?

We would like to learn more about how mothers care for their infants after having a scheduled caesarean section delivery. This study involves:

- different postnatal infant cot types (standalone cot or side-car crib),
- interviews, and
- filming you and your newborn one night on the postnatal ward.

WHY HAVE I BEEN CHOSEN?

You are scheduled to have a caesarean section delivery at the Royal Victoria Infirmary (RVI) and are considering breastfeeding her baby. You are 18 years of age or older. You and your infant are in good health and you did not smoke during pregnancy.

DO I HAVE TO TAKE PART?

No. It is up to you to decide whether or not to take part. If you do, you will be given this information sheet to keep and be asked to sign a consent form. You are still free to withdraw at any time and without giving a reason. A decision to end participation at any time, or a decision not to take part, will not affect the standard of care you receive.

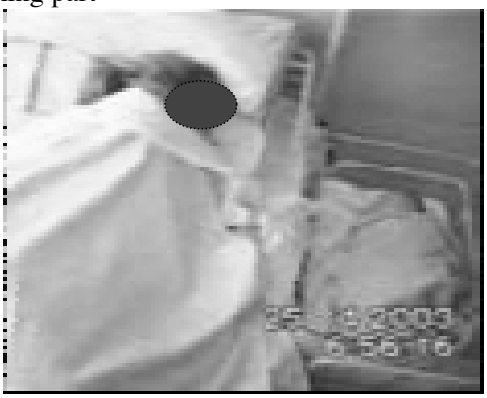
WHAT DO I HAVE TO DO?

Cot Types

Before the birth of your baby, Kristin will inform you of the type of cot that your newborn will have starting the morning after delivery on the postnatal ward. The arrangement will either be the routine standalone cot in your hospital room (that you will have even if you decide not to take part in the study) or a side-car crib attached to your hospital bed. You will have priority for a private or double room on the postnatal ward beginning the day after delivery.

28 babies will have the standalone cot and another 28 babies will have the side-car crib. Both cot types have been used on the RVI postnatal ward before (see below for photographs). You cannot chose which one you will have for the study, but if you feel uncomfortable at any time, you can stop taking part

Standalone cot



Side-car crib

Hospital Interviews

Kristin will talk with you face-to-face for about 20 minutes on the day after delivery in your hospital room or in the postnatal ward coffee room (wherever you prefer). Questions will be about your experience and attitudes regarding infant care, especially in relation to birth and feeding. There are no right or wrong answers. We will also give you the chance to say any other information about your experience that you think would be helpful for us to know.

Filming

After the hospital interview, Kristin will set up video equipment in your room so that you and your newborn can be filmed overnight. She will show you how to use a remote control to start the tape. The camera uses a 'night-shot' lens that allows for filming in the dark. The videotape will record for 8 hours, or until you turn it off. You can use the remote control to stop recording if you wake up for the day before the tape has stopped or if you wish to pause/ end filming anytime. Kristin will return the next morning to ask about 5 minutes of questions about how the night went and take the video equipment away. You will have the assigned cot type (standalone cot or side-car crib) for the rest of your postnatal stay.

We will need some information about your delivery that we can collect from your medical records.

Telephone Interviews

After discharge from the postnatal ward, Kristin will telephone you at the number you provide to talk for about 5 minutes every 2-4 weeks over the course of 6 months. There will be a total of 7 interviews. Questions will be about your experiences and attitudes regarding infant care, especially in relation to feeding, sleep and health. There are no right or wrong answers. We will also give you the chance to tell us any other information about your experience that you think would be helpful for us to know.

The study contributes to understanding how mothers take care of their infants after giving birth and whether the side-car crib makes a difference compared to the standalone cot after caesarean section. Parents and children will benefit form the findings, along with scientists. Your decision about whether or not to participate will not impact your care at the RVI. You will receive a £10 gift voucher for infant products after completion of the telephone interviews as a thank you for taking part.

Appendix C

WHAT ARE THE POSSIBLE DISADVANTAGES AND RISKS OF TAKING PART?
Being a part of this research study involves interviews in which questions will be asked about your birth and postnatal ward experiences. If there is a topic that you prefer not to discuss or that you find embarrassing or upsetting, you may say 'pass' when asked. If your baby is assigned to the side-car crib location and you feel uncomfortable at any time, you may stop taking part in the study and ask to have a standalone cot.

WHAT IS THERE IS A PROBLEM?
Please notify Kristin of issues you would like to discuss with her. Any suggestion or complaint about the way you have been dealt with during the study will be addressed. You may also discuss taking part in the study with Dr. Helen Ball, Dr. Martin Ward-Platt, your midwife or your GP. The detailed information on this is given in PART 2.

WILL MY TAKING PART IN THE STUDY BE KEPT CONFIDENTIAL?
Yes. You may feel that some of this information is very personal. We consider everything you tell us to be strictly confidential and so we will protect your privacy in several ways. First, we will assign you a unique code number in order to identify all of our records for you and your infant – only the researchers will have access to your names and contact information. Data will be kept secure in locked file cabinets in the Durham University Parent-Infant Sleep Laboratory.

When we report the results of the study, you and your child will never be named or identified.

The information you share with us will be kept confidential, unless we receive information that we believe indicates someone is at risk. If you or your baby is thought to be at risk, then we will inform your midwifery staff and/ or GP so that they may be of assistance.

CONTACT DETAILS

Kristin Klingaman
Durham University
Anthropology student
PhD candidate
&
Research Associate
Royal Victoria Infirmary
[Email address]
[Telephone #]

Helen Ball, PhD
Durham University
Senior Lecturer in Anthropology
&
Director, Parent-Infant Sleep Lab
[Email address]
[Telephone #]

Martin Ward-Platt, MD
University of Newcastle
Reader in Child Health
&
Consultant Paediatrician
Royal Victoria Infirmary
[Email address]
[Telephone #]

PART 2
WHAT WILL HAPPEN IF I DON'T WANT TO CARRY ON WITH THE STUDY?
You can end the interviews or stop the video recording at any time and without giving a reason.

WHAT IF I WOULD LIKE TO REPORT A CONCERN?
If you wish to complain or have a comment about the study, you can also contact Dr. Tessa Pollard.

Dr. Tessa Pollard, Director of Postgraduate Studies
Durham University, Department of Anthropology
[Postal address]
[Email address]
[Telephone #]

Harm: Durham University insurance covers claims of negligent harm.

INVOLVEMENT OF THE GENERAL PRACTITIONER/ FAMILY DOCTOR (GP)
You are encouraged to inform your GP about participation.

Appendix C

WHAT WILL HAPPEN TO THE RESULTS OF THE RESEARCH STUDY?
Analysis will be conducted in the Durham Parent-Infant Sleep Laboratory by Kristin and Dr. Ball, with a report produced by 30 September 2008.

A summary of the research results will be mailed or e-mailed to you by Kristin. Findings will be made publicly available on the Durham Parent-Infant Sleep Laboratory website, http://www.dur.ac.uk/sleep.lab.

WHO IS ORGANISING AND FUNDING THE RESEARCH?
This is a student project by PhD candidate Kristin Klingaman of Durham University and supervised by Drs. Ball and Ward-Platt. The researchers have undergone satisfactory criminal records checks and health clearance. The Owen F. Aldis Scholarship is helping to fund this study. Durham University and the Newcastle and North Tyneside NHS Trust sponsor the project.

WHO HAS REVIEWED THE STUDY?
This study was given favourable ethical opinion for conduct by the Newcastle and North Tyneside Research Ethics Committee 1.

Thank you for your time in considering this project. We hope that you will take part and that it will be a great experience. Your information is valuable and will help to improve care for other mothers and infants.

Appendix C

Submission date 17/06/2008 Reference number 06/Q0905/104 Version 3

Participant Number:

CONSENT FORM

Title of Project: Infant care after scheduled caesarean section delivery
Researchers: Kristin Klingaman, Dr. Helen Ball and Dr. Martin Ward-Platt

After reading and considering the following, please **initial the boxes** to indicate that you consent to each statement.

☐ I confirm that I have read and understand the letter of information for volunteers dated 17 June 2008 Version 3 for the above study. I have had the opportunity to consider the information, ask Kristin Klingaman questions and have had these answered satisfactorily.

☐ I understand that all information about me will be kept confidential by the project team and will not be released to anyone without my permission.

☐ I understand that I am welcome to inform my GP or others of my participation in the study.

☐ I understand that participating in The 'Infant Care' study, which involves my baby and me being filmed on the second postnatal night in hospital, will be in addition to my involvement in the North-East Cot Trial.

☐ I understand that if I have a vaginal delivery or an unscheduled 'emergency' caesarean, I will be automatically withdrawn from the project and do not have to notify the research team.

☐ I agree to take part in the above study.

☐ I understand that my participation is voluntary and that I am free to withdraw from The 'Infant Care' study at any time, without giving a reason, without my medical care or legal rights being affected.

_____	_____	_____
(Print) Name of Participant	Date	(Sign) Name of Participant
_____	_____	_____
Researcher Name	Date	Researcher Signature

Appendix C

Postnatal Ward Interview

PARTICIPANT #_____DATE_____

CAESAREAN SECTION DELIVERY

First, how are things going (*did the delivery go as planned*)?

About how long in advance was your caesarean scheduled (*at whose request/ was there an option)*?

What reason(s) did you and/or doctors have for a caesarean?

Before the operation, did you understand why you were going to have a caesarean? (*Do you feel it turned out to be the best for you…for your baby*)?

DEMOGRAPHIC INFORMATION

Is this the first time that you have given birth?

How many other children (have you given birth to)?

Caesarean or vaginal (for each…and any delivery complications)?

Breastfeed? (in hospital, at discharge from hospital, home duration)

DURING THE CAESAREAN SECTION OPERATION

Did you have spinal block anaesthesia?

Did you meet with the anaesthetist ahead of time (*did he or she ask about how you intended to feed you baby*)?

How knowledgeable did you feel about what was happening (just before, during and after the caesarean section)?

How much did you know about your baby's condition during the birth process?

During the operation, could you see what was going on (*Is that the way you wanted it*)?

Did you have a partner/ friend/ or other birth companion present in the operating theatre (*if not, was this your choice*)?

Appendix C

PARTICIPANT #_____DATE_____

PRENATAL FEEDING INTENT

What factors influenced your feeding decision? (*Where did you get the information*?)

Did you feel the feeding decision was up to you? (*Did you feel strongly about it?)*

Were most people who are important to you supportive of how you planned to feed your baby?

Do you know if any of the people close to you have breastfed?

Has anything influenced how you are feeding your baby? (*Is this different than you expected?)*

How much, if any, difficulty did you expect with breastfeeding?

Is there anything that could be different that would make feeding your baby easier?

POST-OPERATIVE EXPERIENCES

Looking back, how prepared were you for the delivery?

What did you feel now (acknowledge all that apply)
Happy about the way things are going
Relieved
Well
Tired
Weak
Ill
Frustrated or upset about the way things are going
Other

Do you think that your experience is about the same as that of most women who undergo caesarean section delivery *or different…in what ways*?

Rate discomfort that you feel right now on a scale of one (1) to four (4), four being the most painful
0 1 2 3 4

Appendix C

PARTICIPANT #_____DATE_____

Do you think anything has impacted your ability to interact with your baby (*has anything you planned to do changed already*)?

How soon after your baby was born did you see her/ him (*what was happening…how'd you feel*)?

Have you stood up since the operation (walked around the room)?

Do you think that there are any factors that influenced your baby's ability or desire to feed?

About how soon after the delivery was your baby first fed? How frequently is your baby feeding since (*breastfeeds….through the night)?*

PLANS FOR AFTER DISCHARGE

Who will primarily feed your baby at home during the day….at night?

What (*breastmilk, formula, combination of both*) do you plan to feed your infant at home during the day…at night (*for about how long*)?

Where do you plan for your baby to sleep at night (what factors influenced this decision)?

If you are employed outside of the home, when do you plan to return to work?

Do you have any advice for women who are going to have caesarean section deliveries (*for families…hospital staff*)?

Appendix C

Participant #_____Date_____

DEMOGRAPHIC INFORMATION

When we write our report from this study we will need to describe the group of people who took part. This is why we need to collect the following statistical information.

1. Married / Living with partner / With partner, living apart / Single, no partner.

2. Please tick next to the **LEVEL OF SCHOOLING** that you have **COMPLETED**:
Left school at or before age 16 with no GCSEs

Left school at or before age 16 with GCSEs

Left school/ college at age 17 + with 1 or more A-levels

Attended postsecondary school or university

Have postsecondary or university degree

Attended postgraduate study

Have postgraduate degree (Master's)

Have doctorate degree (PhD, MD, EdD, etc.)

Other (please specify)

3. Mother's current occupation (or occupation before this pregnancy):_____

4. Occupation of baby's father:_____

5. Mother's Age: _____ 6. Age of Baby's father: _____

7. Mother is White/ Black/ Asian/ other

8. Please tick next to your **HOUSEHOLD INCOME** over the past **YEAR**. This includes what you and partner (if you live together) earned:
Up to £5,000

£5,001- £10,000

£10,001- £15,000

£15,001- £20,000

£20,001- £25,000

£25,001- £30,000

£30,001- £35,000

£35,001- £40,000

£40,001- £45,000

£45,001- £50,000

£50,001- £55,000

£55,001- £60,000

£60,001- 65,000

£65,001- 70,000

£70,001 +

Appendix C

DEBRIEFING INTERVIEW

PARTICIPANT #_____DATE_____ COT TYPE_____

FEEDING
How did the feeding go?

Did you receive enough help and advice about feeding?

How would you rate the help you received (*not enough, just right, too much*)?

How did you feel initiation of breastfeeding was (*compared to how you imagined it would be*)?

SLEEP
How did you and your baby sleep?

How would you rate your quality of sleep on a scale of **1**(v bad) to **10** (v good)?

How many hours do you think you got?

SATISFACTION
How was your overall night-time experience (*horrendous, very bad, bad, fair, good, very good, excellent*)?

Were you happy with where your baby slept last night?

Did you have any problems with the arrangement?

Anything else that you think would be helpful for me to understand your experience:

Appendix C

Submission date 17/6/2008 Reference number 06/Q0905/104 Version 2

LETTER OF INVITATION TO PARTICIPATE IN RESEARCH

Title of Project: Infant care after scheduled caesarean section delivery
Researchers: Kristin Klingaman, Dr. Helen Ball and Dr. Martin Ward-Platt

We would like to invite you to take part in a sub-project of the North-East Cot Trial. We need to find 15 women enrolled in NECOT who are anticipating a scheduled caesarean section delivery to take part in this additional study. The purpose of this study is to explore infant care after scheduled caesarean section delivery in order to improve postnatal support for mothers and newborns. The study involves one overnight video recording of you and your baby while on the postnatal ward. We would be pleased to give you a copy of the video for you to keep if you would like as well as a small thank you gift.

The enclosed information sheet provides details of what the study involves.

You are invited to participate in this study if you:

- are scheduled to deliver your baby by caesarean section at the Royal Victoria Infirmary,
- are considering breastfeeding your baby,
- are pregnant with a single baby,
- are expected to deliver after at least 37 weeks gestation,
- are 18 years of age or older and
- did not smoke during pregnancy.

Please contact Kristin Klingaman [Telephone #], [Email address] for more information or to communicate your agreement to participate. If you would like to take part, please complete the consent form and return it in the enclosed self-addressed freepost envelope. Please keep this letter and the information sheet for your reference.

Thank you for considering taking part in this additional study.

Submission date 17/06/2008 Reference number 06/Q0905/104 Version 4

PARTICIPANT INFORMATION SHEET

Title of Project: Infant care after scheduled caesarean section delivery
Researchers: Kristin Klingaman, Dr. Helen Ball and Dr. Martin Ward-Platt

As a participant in the NECOT Trial you are being invited to take part in a related research study. Before you decide, it is important for you to understand why the research is being done and what it will involve. Please read the following information carefully and discuss it with others if you wish. Contact us anytime if there is anything that is not clear or if you would like more information. Thank you.

- *PART 1 tells you the purpose of this study and what will happen to you if you take part.*
- *PART 2 gives you more detailed information about the conduct of the study.*

PART 1

WHAT IS THE PURPOSE OF THE STUDY?

We would like to learn more about how mothers care for their infants after having a scheduled caesarean section delivery. This study involves:

- a stationary camera filming the interactions between you and your newborn. It will be conducted over a single night on the postnatal ward.

WHY HAVE I BEEN CHOSEN?

You are scheduled to have a caesarean section delivery at the Royal Victoria Infirmary and are enrolled to take part in the NECOT Trial. As part of NECOT you have been allocated a standalone cot at the Royal Victoria Infirmary postnatal ward and do not intend to transfer to another hospital after delivery.

DO I HAVE TO TAKE PART?

No. It is up to you to decide whether or not to take part, and your decision about whether to participate in this study will not affect your participation in NECOT. If you are willing to take part in this study you should keep this information sheet and should complete and sign the consent form. You are still free to withdraw at any time and without giving a reason. If you decide to change your mind about taking part in this study it will not affect the standard of care you receive.

WHAT DO I HAVE TO DO?

- **Filming**
  Kristin will set up video equipment in your room after visiting hours on the second

night after delivery so that you and your baby can be filmed overnight. She will show you how to use a remote control to start the tape. The camera uses a 'night-shot' lens that allows for filming in the dark. No lights need to be on in your room and there are no lights from the filming equipment. The videotape will record for 8 hours, or until you turn it off. You can use the remote control to stop recording if you wake for the day before the tape has stopped or if you wish to pause/ end filming anytime.

The study will help us to understand how mothers care for and feed their infants following a caesarean section delivery. Parents and children will benefit from the findings, along with researchers and hospital staff. As a 'Thank-you' for taking part we are happy to offer you a £25 'Boots' gift card.

WHAT ARE THE POSSIBLE DISADVANTAGES AND RISKS OF TAKING PART?

Being a part of this research study involves video recording of you and your baby on the second postnatal night. There are no risks involved in being filmed, but it may feel a little strange or uncomfortable at first. If there is a time that you prefer not to be filmed, you can use the remote control to stop the filming.

WHAT IF THERE IS A PROBLEM?

Please notify Kristin Klingaman of issues you would like to discuss with her. Any suggestion or complaint about the way you have been dealt with during the study will be addressed. You may also discuss taking part in the study with Dr. Helen Ball, Dr. Martin Ward-Platt, your midwife or your GP. The detailed information on this is given in PART 2.

WILL MY TAKING PART IN THE STUDY BE KEPT CONFIDENTIAL?

Yes. You may feel that some of this information is very personal. We consider everything you tell us to be strictly confidential and so we will protect your privacy in several ways. First, we will assign you a unique code number in order to identify all of our records for you and your infant – only members of the research staff will have access to your names and contact information and these will be kept separate from any data from the study. Data will be kept secure in locked file cabinets in the Durham University Parent-Infant Sleep Laboratory and only the researchers will have access.

When we report the results of this study, you and your child will never be named or identified.

The information you share with us will be kept confidential, unless we receive information that we believe indicates someone is at risk. If you or your baby if thought to be at risk, then we are legally obliged to inform your midwifery staff, health visitor, and/ or GP so that they may be of assistance.

CONTACT DETAILS

Kristin Klingaman	Helen Ball, PhD	Martin Ward Platt, MD
Durham University	Durham University	University of Newcastle
Research student	Professor of Anthropology	Consultant Paediatrician
&	&	&
Research Associate	Director, Parent-Infant Sleep Lab	Reader in Child Health
Royal Victoria Infirmary	[Email address]	Royal Victoria Infirmary
[Email address]	[Telephone #]	[Email address]
[Telephone #]		[Telephone #]

PART 2

WHAT WILL HAPPEN IF I DON'T WANT TO CARRY ON WITH THE STUDY?

You can stop the video recording at any time and without giving a reason.

WHAT IF I WOULD LIKE TO REPORT A CONCERN?

If you have a concern about any aspect of this study, you should ask to speak to the researchers (using the contact details above) who will do their best to answer your questions. If you remain unhappy and wish to complain formally, you can do this through the NHS Complaints Procedure by contacting:

Mr P Anderson, Patient Services Officer
Newcastle upon Tyne Hospitals NHS Foundation Trust
[Postal address]
[Telephone #]

In the event that something does go wrong and you are harmed during the research due to someone's negligence then you may have grounds for a legal action for compensation against Newcastle upon Tyne Hospitals NHS Foundation Trust but you may have to pay your legal costs. The normal National Health Service complaints mechanisms will still be available to you. Durham University insurance covers claims of negligent harm.

WHAT WILL HAPPEN TO THE RESULTS OF THE RESEARCH STUDY?

Analysis will be conducted in the Durham Parent-Infant Sleep Laboratory by Kristin Klingaman and Dr. Helen Ball, with a report produced by September 30, 2009.

A summary of the research results will be mailed to you by Kristin Klingaman. Findings will be made publicly available on the Durham Parent-Infant Sleep Laboratory website, http://www.dur.ac.uk/sleep.lab/.

WHO IS ORGANISING AND FUNDING THE RESEARCH?

This is a PhD research project led by Kristin Klingaman of Durham University and supervised by Dr. Ball and Dr. Ward-Platt. The researchers involved in this study have undergone a satisfactory criminal records check and health clearance. The Owen F. Aldis Scholarship is helping fund this study. Durham University and the Newcastle upon Tyne Hospitals NHS Foundation Trust sponsor the project.

WHO HAS REVIEWED THE STUDY?

This study was given a favourable ethical opinion for conduct by the Newcastle and North Tyneside Research Ethics Committee 1.

Thank you for your time in considering this project. We hope that you will take part and that it will be a great experience. Your information is valuable and will help to improve care for other mothers and infants.

Submission date 17/06/2008 Reference number 06/Q0905/104 Version 3

Participant Number:

CONSENT FORM

Title of Project: Infant care after scheduled caesarean section delivery
Researchers: Kristin Klingaman, Dr. Helen Ball and Dr. Martin Ward-Platt

After reading and considering the following, please **initial the boxes** to indicate that you consent to each statement.

☐ I confirm that I have read and understand the letter of information for volunteers dated 17 June 2008 Version 3 for the above study. I have had the opportunity to consider the information, ask Kristin Klingaman questions and have had these answered satisfactorily.

☐ I understand that all information about me will be kept confidential by the project team and will not be released to anyone without my permission.

☐ I understand that I am welcome to inform my GP or others of my participation in the study.

☐ I understand that participating in The 'Infant Care' study, which involves my baby and me being filmed on the second postnatal night in hospital, will be in addition to my involvement in the North-East Cot Trial.

☐ I understand that if I have a vaginal delivery or an unscheduled 'emergency' caesarean, I will be automatically withdrawn from the project and do not have to notify the research team.

☐ I agree to take part in the above study.

☐ I understand that my participation is voluntary and that I am free to withdraw from The 'Infant Care' study at any time, without giving a reason, without my medical care or legal rights being affected.

_____	_____	_____
(Print) Name of Participant	Date	(Sign) Name of Participant
_____	_____	_____
Researcher Name	Date	Researcher Signature

MEDICAL RECORD INFORMATION

Participant #_____Date_____

Maternal use during pregnancy:
- Cigarettes
- Alcohol
- Medication

Mother height, weight, BMI

Labour before caesarean?

Complications during delivery

Infant birth weight

Apgar scores

Type of anaesthesia
- Particular drugs used

Feeding notes

Other relevant details:

TELEPHONE FOLLOW-UP

WEEK_____PARTICIPANT #_____DATE_____

GENERAL

First, how are things going?

(If applicable) Since the last time we spoke, have you been back to work ? How is it going?

Have you had any concerns about your baby's health (with your health)?
Have you contacted a doctor / health professional?
Have your midwives/ health visitors been helpful?

FEEDING

About how often do you feed your baby during the **day** (between 8 AM and 8 PM)

And how many times during the **night** (between 8 PM and 8 AM)

Is it you who primarily feeds your baby?

(If applicable) Are you currently breastfeeding?
During the **day**
During the **night**

Do you always feed your baby at the breast or have you also expressed breast milk?

(If applicable) When did you change the way you feed him / her? What factors influenced this decision?

Have you given your baby any water, formula or solids in the last 2 weeks?.

Do you think there are any factors that have affected your infant's feeding behaviour?
(Ask only at week 2, 12 and 24)

Has anything (or anyone) influenced the way you feed your infant?
(Ask only at week 2, 12 and 24)

WEEK_____PARTICIPANT #_____DATE_____

SLEEP AND FEEDING

Now I'm going to ask some questions about last night specifically:

About how much time passed last night between the last feed and when (he/ she) fell asleep?

Was (his / her) feed supplemented with water, formula or solids yesterday?

How many more times did your baby feed last night (*until 8 AM*)?

Where was your baby put down to sleep at the beginning of last night (*when you went to bed, for most of night*)?

(If not evident from responses above) Have you slept with your baby in your bed for any amount of time since we last spoke?

If yes:

About many times per week?

Under what circumstances do you bring your baby into bed to sleep with you?

For about how long does he/ she sleep in the bed with you?

WEEK_____PARTICIPANT #_____DATE_____

PAIN AND RECOVERY

How is your recovery going (*as expected or any better/ worse*)?
(*Ask only at 2, 12 and 24 weeks*)

Do you feel discomfort right now?
(If so, *Rate* 0 1 2 3 4)
(*Ask only until the participant rates 0 for the first time*)

Now I'll go over the same list of feelings that I have said before. After I say each one, could you please say if it applies for right now?

What did you feel now (acknowledge all that apply)

Happy about the way things are going	
Relieved	
Well	
Tired	
Weak	
Ill	
Frustrated or upset about the way things are going	
Other	

That's it, unless there is anything else going on with your or your baby that has had an effect on the way you taking care of him/ her?

Nissen and colleagues (2006) conducted research into maternal postnatal ward hormone levels and reported breastfeeding frequency as part of descriptive statistics about the participants. The median and range of those who underwent an unscheduled caesarean section (n = 17) was 12 (10 – 16). Dividing the median breastfeeding sessions by the time since delivery, 62 hours (48 – 72), results in a calculation of 0.19 breastfeeds per hour. This pooling of data is not the appropriate way to calculate the breastfeeding frequency (refer to p. 62). Comparison of the results is also limited because:

- all of their participants underwent labour,
- included women who had general anaestheisa (n = 10),
- there was no description of what constituted a breastfeeding session,
- the study was not powered to detect a difference in breastfeeding frequency
- the authors did not report how the breastfeeding data were collected.

Chen and colleagues (1998) had mothers record the timing of when they put the infant on and off of the breast on the postnatal ward. The purpose of their study was document the impact of childbirth 'stress' on lactation hormones, breastfeeding frequency and the onset of lactogenesis II. Over the course of postpartum day 1, caesarean section mothers (n = 5) reported breastfeeding an average and standard deviation of 6.4 $\pm$ 0.9. Dividing by the 24 hours over which the participants were instructed to record their infant feeding, breastfeeding frequency per hour can be estimated as 0.27. The definition of the interval that comprised the breastfeeding sessions in their analyses was not provided and the few number of participants (including 1 with general anaesthesia), limits the applicability to my power calculation.

Phase 1 maternal demographics by scheduling of the study caesarean section delivery.[1]

Participants	Ph. 1 unscheduled *n* = 48	Ph. 1 scheduled *n* = 27
	Median (range) or *n*, %	
Obstetric history:		
- Previous deliveries	0 (0 – 3)	1 (0 – 3)
- Previously had a caesarean section	7, 14.6	15, 55.6
- Previously had complications with vaginal delivery	28.6% of those who had vaginal delivery	40% of those who had vaginal delivery
Maternal characteristics:		
- Age in years	28 (18 – 39)	*n* = 25 32 (19 – 41)
- Living with partner	41, 85.4	23, 85.2
- Married	22, 43.8	15, 55.6
- Level of education completed	*n* = 47 Attended university (no GCSEs – Master's)	Attended university (no GCSEs – Doctorate)
- Household income over the past year in thousands of GBP	*n* = 34 30 – 35 (10 – 70+)	*n* = 24 30 – 35 (10 – 70+)
- Smoked throughout pregnancy	*n* = 43 7, 26.3	*n* = 25 3, 12
Infant feeding:		
- Previously breastfed (for any duration)	7, 14.6	12, 44.4
- Previously breastfed (for ≥ 6 weeks)	*n* = 47 5, 10.6	*n* = 26 7, 26.9
- Intended to breastfeed (during the latest pregnancy)	33, 68.8	20, 74.1
Ethnicity:		
- White European	45, 93.8	19, 70.4
- Afro-Caribbean	1, 2.1	None
- Asian*	2, 4.2	8, 29.6

[1] The only significant difference between the recorded characteristics of Phase 1 women by caesarean section scheduling was Asian ethnicity. Women who scheduled the caesarean section delivery had a median of 1 previous birth compared to the median parity of 0 among those who did not schedule the caesarean, but the difference between para and nullipara was not significant: 13 parous women v. 35 nulliparous women unscheduled compared to 20 parous women v. 7 nulliparous women scheduled, $x^2 = 0.9134$ $df = 1$ p = 0.3392.

Phase 1 infant demographics by caesarean section scheduling.

Participants	Ph.1 unscheduled *n* = 53 infants, 48 deliveries	Ph. 1 scheduled *n* = 29 infants, 27 deliveries
Infant characteristics:		
- Twin	10 infants 5/48 (10.4%) of unscheduled were of twins	4 infants 2/27 (7.4%) of scheduled were of twins
- Female *n* = 81 known sex	24 infants 20/47 (42.6%) of unscheduled included female infants	18 infants 16/27 (59.3%) of scheduled included females infants

Phase 1 maternal demographics by Asian and non-Asian ethnicity.[1]

Participants	Asian women *n* = 10	Non-Asian women *n* = 65
	Median (range) or *n*, %	
Obstetric history:		
- Previous deliveries	0.5 (0 – 2)	0 (0 – 3)
- Previously had a caesarean section	2, 20	20, 30.8
- Previously had complications with vaginal delivery	33.3% of those who had vaginal delivery	33.3% of those who had vaginal delivery
Maternal characteristics:		
- Age in years	32.5 (24 – 40)	*n* = 63 29 (18 – 41)
- Living with partner	10, 100	54, 83.1
- Married*	10, 100	27, 41.5
- Level of education completed	University degree (no GCSEs – Doctorate)	*n* = 64 Attended university (no GCSEs – Master's)
- Household income over the past year in thousands of GBP	*n* = 8 30 (10 – 70+)	*n* = 50 30 – 35 (10 – 70+)
- Smoked throughout pregnancy	None	*n* = 58 10, 17.2
Infant feeding:		
- Previously breastfed (for any duration)	5, 50	14, 21.5
- Previously breastfed (for ≥ 6 weeks)	*n* = 9 3, 33.3	*n* = 64 9, 14.1
- Prenatally intended to breastfeed*	10, 100	43, 66.2

[1] More non-Asian women were recorded as having smoked throughout the study pregnancy than did Asian participants, but the difference was not significant, p = 0.3371. Being married and preantally intending to breastfeeding were both associated with Asian ethnicity, p = 0.0004, and p = 0.0289, compared to the non-Asian participants. The p-values were calculated using Fisher's Exact test.

Phase 2 maternal demographics by levels of study completion.

Participants	Ph. 2 postnatal interview $n = 40$
	Ph. 2 postnatal filming $n = 35$
	Median (range) or *n*, %
Obstetric history:	
- Previous deliveries	0 (0 – 6)
	1 (0 – 6)
- Previously had a caesarean section delivery	22, 55
	21, 60
- Previously had complications with vaginal delivery	92.3% of those who had vaginal delivery
	83.3% of those who had vaginal delivery
Maternal characteristics:	
- Age in years	34 (23 – 41)
	35 (23 – 41)
- Living with partner	39, 97.5
	33, 94.3
- Married	31, 77.5
	28, 80
- Level of education completed	*n* = 38 Undergraduate degree (no GCSEs – Doctorate)
	n = 33 Undergraduate degree (GCSEs – Doctorate)
- Household income over the past year in thousands of GBP	*n* = 35 40 – 45 (5 – 70 +)
	n = 30 40 – 45 (5 – 70 +)
Infant feeding:	
- Previously breastfed (for any duration)	27 67.5
	29, 82.9
- Previously breastfed (for ≥ 6 weeks)	22, 55
	n = 34 24, 70.6
Ethnicity:	
- White European	34, 85
	29, 82.9
- Afro-Caribbean	2, 5
	2, 5.7
- Asian	4, 10
	3, 11.4

Phase 2 infant demographics by levels of study completion.

Participants	Ph. 2 postnatal interview $n = 40$
	Ph. 2 postnatal filming $n = 35$
	Median (range) or *n*, %
Infant characteristics:	
- Female	26, 65
	22, 62.9
- Gestational age in days	$n = 35$ 274 (263 – 289)
	$n = 31$ 274 (269 – 288)
- Weight in kilograms	3.59 (2.30 – 4.39)
	3.59 (2.30 – 4.55)
- APGAR at 1 minute	9 (8 – 9)
	9 (8 – 9)
- APGAR at 5 minutes	9 (9 – 10)
	9 (9 – 10)

Phase 2 filmed maternal demographics by the randomly allocated postnatal ward cot type.

Participants	Ph. 2 side-car crib $n = 20$
	Ph. 2. standalone cot $n = 15$
	Median (range) or n, %
Obstetric history:	
- Previous deliveries	1 (0 – 2)
	1 (0 – 6)
- Previously had a caesarean section delivery	13, 65
	8, 53.3
- Previously had complications with vaginal delivery	100% of those who had vaginal delivery
	75% of those who had vaginal delivery
Maternal characteristics:	
- Age in years	34 (25 – 41)
	35 (23 – 40)
- Living with partner	20, 100
	14, 93.3
- Married	18, 90
	10, 66.7
- Level of education completed	$n =$ 19 Undergraduate degree (no GCSEs – Doctorate)
	$n =$ 14 Undergraduate degree (GCSEs – Doctorate)
- Household income over the past year in thousands of GBP	$n = 17$ 50 – 55 (5 – 70+)
	$n = 13$ 35 – 40 (5 – 70+)
Infant feeding:	
- Previously breastfed (for any duration)	16, 80
	13, 86.7
- Previously breastfed (for $\geq$ 6 weeks)	$n = 19$ 12, 63.2
	12, 80
Ethnicity:	
- White European	17, 85
	12, 80
- Afro-Caribbean	1, 5
	1, 6.7
- Asian	2, 10
	2, 13.3

Phase 2 filmed infant demographics by the randomly allocated postnatal ward cot type.

Participants	Ph. 2 side-car crib $n = 20$
	Ph. 2. standalone cot $n = 15$
	Median (range) or n, %
Infant characteristics:	
- Female	12, 60
	11, 73.3
- Gestational age in days	$n =$ 17 275 (269 – 288)
	$n =$ 14 274 (272 – 280)
- Weight in kilograms	3.60 (2.92 – 4.39)
	3.71 (2.30 – 4.55)
- APGAR at 1 minute	9 (8 – 9)
	9 (8 – 9)
- APGAR at 5 minutes	9 (9 – 10)
	9 (9 – 10)

Maternal demographics by type of caesarean section delivery undergone.

Participants	Ph. 1 unscheduled *n* = 53	Ph. 1 scheduled *n* = 22	Ph. 2 scheduled *n* = 40
		n, %	
Infant feeding:			
- Previously breastfed (for any duration)	10, 18.9	9, 40.9	27, 67.5
- Previously breastfed (for ≥ 6 weeks)	*n* = 52 8, 15.4	n = 21 4, 19	22, 55
- Intended to breastfeed (during the latest pregnancy)	36, 67.9	17, 77.3	Inclusion criterion
Anaesthesia during the caesarean section:			
- Epidural	18, 34	1, 4.8	1, 2.5
- Spinal block	26, 49	21, 95.5	39, 97.5
- General	9, 17	None	None
Accompaniment during the caesarean section:			
- Family or friend present	44, 83	21, 95.5	*n* = 38 36, 94.7

The Phase 1 women who underwent scheduled caesareans had more breastfeeding experience and current intent than those who had unscheduled deliveries, but the association was not significant at the $p \leq 0.05$ level.

Royal Victoria Infirmary protocol stipulates that when caesarean section deliveries are conducted with general anaesthesia, personal attendants cannot be present with the mother.

Phase 1 infant demographics by type of caesarean section delivery undergone.

Participants	Ph. 1 unscheduled *n* = 58
	Ph. 1 scheduled *n* = 24
	Median (range) or *n*, %
Infant characteristics:	
- Gestation in days	*n* = 56 278 (185 – 300)
	273 (265 – 291)
- Weight in kilograms	*n* = 54 3.30 (0.73 – 4.60)
	3.43 (2.26 – 4.14)
- Singleton	48, 90.6
	20, 90.9
- Female	*n* = 57 26, 45.6
	16, 66.7
- APGAR at 1 minute	*n* = 53 8 (1 – 9)
	8 (5 – 9)
- APGAR at 5 minutes	*n* = 52 9 (3 – 10)
	9 (9)
- Received intensive care	8, 13.8
	1, 4.2

Phase 1 maternal reports of their preparedness to undergo a caesarean section by caesarean section scheduling.

Participants	Ph. 1 unscheduled *n* = 48	Ph. 1 scheduled *n* = 27
	n, %	
Maternal preparedness:		
- No time for discussion or described feeling totally unprepared	12, 25 (4 had general anaesthesia)	None
- Little time for discussion	20, 41.7 (3 had general anaesthesia)	None
- More time for discussion	15, 31.3 (2 had general anaesthesia)	10, 37
- Knew what to expect because had previously undergone a caesarean section	1, 2	20, 63

I did not test the association of maternal preparedness to caesarean section scheduling because the nature of booking a delivery inherently implies having a longer time to learn about the procedure and to process one's feelings regarding the experience. This is the reason that I did not ask this question in the Phase 2 interview, although upon reflection I could have inquired since 18 of the 40 women had not previously undergone a caesarean section delivery and there was variation in the reported preparedness among Phase 1 women who had previously experienced a caesarean section.

Phase 1 maternal reflection on the experience of their caesarean section deliveries.

Participants	Ph1. *n* = 75
	n, %
Maternal reflection on their caesarean section deliveries:	
- Better	27, 36
- Comparable	20, 26.7
- Did not know what to expect	5, 6.7
- Worse	23, 30.7

Delivery satisfaction (better, comparable or no expectations versus worse) did not vary by the type of caesarean that the Phase 1 women underwent: 35 versus 18 unscheduled compared to 17 versus 5 scheduled, p = 0.5617. Participant rating their caesarean section deliveries as worse was not associated to them reporting having little to no time to prepare compared to those women who said they had more time or discussion or who had previously experienced a caesarean section: 11/23 versus 22/52, x^2 =0.6571 *df* = 1, p = 0.4176.

Maternal satisfaction with the caesarean section by type of delivery undergone

Participants	Ph. 1 unscheduled *n* = 52	Ph. 1 scheduled *n* = 22	Ph. 2 scheduled *n* = 37
		n, %	
Compared to other caesarean section deliveries:			
- Better	9, 17.3	6, 27.3	8, 21.6
- Comparable	11, 21.2	8, 36.4	16, 43.2
- Different	20, 38.5	5, 22.7	10, 27
- Worse	12, 23.1	3, 13.6	3, 8.1
Compared to vaginal deliveries:			
- Better	11, 21.2	3, 13.6	No data
- Comparable	8, 15.4	1, 4.5	No data
- Different	24, 46.2	15, 68.2	No data
- Worse	9, 17.3	3, 13.6	No data

Undergoing a caesarean section with general anaesthesia was not associated with a greater proportion of Phase 1 participants describing their deliveries as worse than anticipated compared to those who had an epidural or spinal, with 4/9 (44.4%) and 19/66 (28.2%) respectively, p = 0.4434. Having a baby who received intensive care was not associated with dissatisfaction compared to those whose infants did not go to the Special Baby Care Unit in Phase 1, with 4 of 8 SBCU rating worse (50%) compared to 19 of 67 healthy rating worse (28.4%), p = 0.2395. These p-values were calculated using Fisher's Exact test.

Maternal reflection on the decision for the caesarean section delivery.

Participants	Ph. 1 *n* = 75 Ph. 2 *n* = 36
	n, %
Women's thoughts on if their caesarean was the right or best 'option'	
- Yes	33, 42.7 18, 50
- Probably	3, 4 5, 13.9
- Under the circumstances	39, 52 12, 33.3
- Don't know	1, 1.3 1, 2.8

Maternal report of the first breastfeed or attempted breastfeed by the reported reasons for breastfeeding intent.

Participants	Ph. 1 infant-only *n* = 23	Ph. 1 included mother *n* = 20
	Ph. 2 infant-only *n* = 16	Ph. 2 included mother *n* = 22
	n, %	
When mothers first breastfed or attempted to breastfeed:		
- Operating theatre	1, 4.3	1, 5
	None	None
- Recovery room	13, 56.5	8, 40
	13, 86.7	20, 90.9
- Postnatal ward, Day 0	4, 17.4	10, 50
	2, 13.3	2, 9.1
- Postnatal ward, Days 1 +	2, 8.7	1, 5
	None	None
- No attempts	2, 8.7	None
	1, 6.3	None

Maternal reports of breastfeeding difficulties by type of caesarean section delivery undergone.

Participants	Ph. 1 unscheduled *n* = 30	Ph. 1 scheduled *n* = 16	Ph. 2 scheduled *n* = 39
		n, %	
Maternal breastfeeding difficulties:			
- Mobility	5, 16.7	5, 31.3	17
- Incision pain	5, 16.7	5, 31.3	10
- Tiredness	6, 20	3, 18.8	9
Infant breastfeeding difficulties:			
- Perceived lack of interest	11, 36.7	5, 31.3	9
- Poor physical condition	3, 10	2, 12.5	14
- Perceived lack of satiation	2, 6.7	3, 18.8	7
- Latching	7, 23.3	1, 6.3	4

Maternally described frequency of breastfeeds or attempted breastfeeds on the postnatal ward by type of caesarean section delivery undergone.

Participants	Ph. 1 unscheduled *n* = 27 Ph. 1 scheduled *n* = 15
	n, %
Breastfeeding descriptions:	
- Infrequent	3, 11.1
	4, 26.7
- Variable	12, 44.4
	6, 40
- Frequent	12, 44.4
	5, 33.3

Phase 1 maternal reports of breastfeeding frequency by the timing of the postnatal ward interviews.

Breastfeeding description	Infrequent *n* = 7	Variable *n* = 18	Frequent *n* = 17
		n, %	
When the interview was conducted on the postnatal ward:			
- Day 1 *n* = 20 interviews	5, 71.4	9, 50	6, 35.3
- Day 2 *n* = 16 interviews	1, 14.3	8, 44.4	7, 41.2
- Day 3 *n* = 4 interviews	None	1, 5.6	3, 17.6
- Day 4 *n* = 1 interview	1, 14.3	None	None
The interview not conducted on the postnatal ward:			
- Posted *n* = 1 interview	None	None	1, 5.9

Phase 2 maternal reports of breastfeeding difficulties by the randomly allocated postnatal ward cot type.

Participants	Standalone cot $n = 13$
	Side-car crib $n = 26$
	n, %
Maternal breastfeeding difficulties:	
- Mobility	9, 69.2
	8, 30.8
- Incision pain	3, 23.1
	5, 19.2
- Tiredness	2, 15.4
	7, 26.9
Infant breastfeeding difficulties:	
- Perceived lack of interest	5, 38.5
	4, 15.4
- Poor physical condition	4, 30.8
	10, 38.5
- Perceived lack of satiation	2, 15.4
	5, 19.2
- Latching	None
	4, 15.4

Breastfeeding frequency during the observation period by the randomly allocated postnatal ward cot type (intention-to-treat analyses).

Participants	Side-car crib $n = 20$
	Standalone cot $n = 14$
	Median (range)
Breastfeeding frequency per hour:	
- Observation	0.64 (0.12 – 1.61)
	0.40 (0.00 – 1.07)
- Observation + estimate	0.74 (0.12 – 1.61)
	0.42 (0.00 – 1.11)
Breastfeeding effort per hour:	
- Observation	0.73 (0.12 – 1.64)
	0.40 (0.00 – 1.11)
- Observation + estimate	0.77 (0.12 – 1.64)
	0.42 (0.00 – 1.11)
Nipple stimulation per hour:	
- Observation	0.72 (0.12 – 1.64)
	0.40 (0.00 – 1.11)
- Observation + estimate	0.76 (0.12 – 1.64)
	0.42 (0.00 – 1.11)

The frequency of breastfeeds did not vary between the side-car crib and the standalone cot groups by: observation [0.26 (-0.01 – 0.52), p = 0.093] or observation + estimates [0.18 (-0.09 – 0.45), p = 0.283]. Breastfeeding effort per hour was not associated with the side-car crib or standalone cot groups by: observation [0.27 (-0.01 – 0.56), p = 0.099] or observation + estimates [0.26 (-0.02 – 0.53), p = 0.122]. Nipple stimulation per hour also was not different according to whether participants were allocated the side-car crib or standalone cot by: observation [0.26 (-0.02 – 0.54), p = 0.114] or observation + estimates [0.23 (-0.05 – 0.51), p = 0.169].

Breastfeeding frequency was greater among bedsharers compared to those who used the standalone cot: by observation [0.40 (0.05 – 0.75), p = 0.028] and observation + estimates [0.39 (0.05 – 0.73), p = 0.040] or the side-car crib by: observation + estimates [0.36 (0.07 – 0.66), p = 0.018]. Breastfeeding effort was more frequent among bedsharers compared to those who used: standalone cot by: observation + estimates [0.41 (0.08 – 0.75), p = 0.023] side-car crib by: observation [0.29 (-0.06 – 0.64), p = 0.041] and observation + estimates [0.33 (0.001 – 0.66), p = 0.005]. Nipple stimulation was more frequent among bedsharers compared to those who used the standalone cot by: observation + estimates [0.41 (0.08 – 0.75), p = 0.023] and versus side-car crib use by: observation [0.29 (-0.06 – 0.64), p = 0.041] and observation + estimates [0.33 (0.001 – 0.66), p = 0.018].

The mean difference between side-car crib and standalone cot bedsharers (95% CI) was 0.54 (0.03 – 1.06) by observation, p = 0.089, and the observation + estimates difference was 0.44 (-0.02 – 0.89), p = 0.089. These p-values were calculated using the Mann-Whitney U test.

Proportion of postnatal ward bedsharing during the observation period by the randomly allocated postnatal ward cot types (intention-to-treat analyses).

Participants	Side-car crib $n = 20$
	Standalone cot $n = 15$
	Median (range)
Proportion per observed hour:	
- Bedsharing as the infant sleep location	0.22 (0.003 – 0.85)
	0.19 (0.019 – 0.97)
- Bedsharing as the infant location when mother asleep	0.22 (0.000 – 1.00)
	0.04 (0.000 – 0.98)

Phase 2 maternal demographics by the postnatal ward cot type primarily used as the infant sleep location (on-treatment analyses).

Participants	Side-car crib *n* = 13	Standalone cot *n* = 11	Maternal bed *n* = 11
	Median (range) or *n*, %		
Obstetric history:			
- Previous deliveries	1 (0 –1)	1 (0 – 6)	1 (0 – 2)
- Previously had a caesarean section delivery	9, 69.2	5, 45.5	7, 63.6
- Previously had complications with vaginal delivery	100% of those who had vaginal delivery	71.4% of those who had vaginal delivery	100% of those who had vaginal delivery
Maternal characteristics:			
- Age in years	35 (25 – 41)	35 (23 – 40)	34 (26 – 38)
- Living with partner	13, 100	10, 90.9	11, 100
- Married	12, 92.3	6, 54.5	10, 90.9
- Level of education completed*	*n* = 12 Undergraduate deg. (GCSEs – Doctorate)	*n* = 10 Undergrad degree (GCSEs – Doctorate)	Postgrad degree (Undergrad degree – Doctorate)
- Household income over the past year in thousands of GBP	*n* = 10 50 (20 – 70+)	*n* = 9 40 – 45 (5 – 70+)	40 – 45 (20 – 70+)
Infant feeding:			
- Previously breastfed (for any duration)	10, 76.9	9, 81.8	10, 90.9
- Previously breastfed (for ≥ 6 weeks)	*n* = 12 6, 50	8, 72.7	10, 90.9
Ethnicity:			
- White European	11, 84.6	10, 90.9	8, 72.7
- Afro-Caribbean	1, 7.7	None	1, 9.1
- Asian	1, 7.7	1, 9.9	2, 18.2

Phase 2 infant demographics by the postnatal ward cot type primarily used as the infant sleep location (on-treatment analyses).

Participants	Side-car crib *n* = 13	Standalone cot *n* = 11	Maternal bed *n* = 11
	Median (range) or *n*, %		
Infant characteristics:			
- Female	5, 34.8	8, 72.7	9, 81.8
- Gestational age in days	*n* = 12 277 (269 - 288)	*n* = 10 274 (272 – 280)	*n* = 9 276 (272 – 284)
- Weight in kilograms	3.59 (2.92 – 4.03)	3.75 (2.88 – 4.55)	3.59 (2.30 – 4.49)
- APGAR at 1 minute	9 (8 – 9)	9 (8 – 9)	9 (8 – 9)
- APGAR at 5 minutes	9 (9 – 10)	9 (9 – 10)	9 (9 – 10)

Phase 2 postnatal ward breastfeeding frequency by the postnatal ward cot type primarily used as the infant sleep location (on-treatment analysis).

Participants	Side-car crib *n* = 13	Standalone cot *n* = 11	Maternal bed *n* = 11
		Median (range)	
Breastfeeding frequency per hour:			
- Observation	0.49 (0.12 – 1.26)	0.40 (0.00 – 0.92)	0.86 (0.00 – 1.61)
- Observation + est.	0.49 (0.12 – 1.26)	0.40 (0.00 – 1.11)	0.86 (0.25 – 1.61)
Breastfeeding effort per hour:			
- Observation	0.50 (0.12 – 1.64)	0.40 (0.00 – 1.11)	0.89 (0.00 – 1.61)
- Observation + est.	0.50 (0.12 – 1.64)	0.40 (0.00 – 1.11)	0.89 (0.25 – 1.61)
Nipple stimulation per hour:			
- Observation	0.50 (0.12 – 1.64)	0.40 (0.00 – 1.11)	0.89 (0.00 – 1.61)
- Observation + est.	0.50 (0.12 - 1.64)	0.40 (0.00 - 1.11)	0.89 (0.25 - 1.61)

The frequency of breastfeeding sessions among bedsharers compared to side-car crib users by observation only was not significantly associated: 0.31 (-0.02 – 0.63), p = 0.063. Breastfeeding frequency between the side-car crib versus standalone cot did not vary by observation: 0.09 (-0.19 - 0.38), p = 0.649, or by observation + estimates: 0.03 (-0.28 – 0.33), p = 0.955.

The frequency of breastfeeding effort (sessions + attempts) was not associated with side-car crib compared to standalone cot use by observation: 0.09 (-0.24 – 0.42), p = 0.776, or by observation + estimates: 0.09 (-0.25 – 0.42), p = 0.820, or between the maternal bed and standalone cot groups by observation: 0.38 (0.01 - 0.75), p = 0.056.

The frequency of nipple stimulation (sessions + effort + expression) did not vary between the side-car crib and standalone cot groups by observation: 0.08 (-0.25 - 0.40), p = 0.776, or by observation + estimates: 0.09 (-0.25 – 0.42), p = 0.820, or the maternal bed and the standalone cot by observation: 0.36 (-0.01 – 0.73), p = 0.065. These p-values were calculated using the Mann-Whitney U test.

Maternal demographics by the cot group from which the postnatal ward bedsharers derived.

Participants	Bedsharers from side-car crib $n = 7$ Bedsharers from standalone cot $n = 4$
	Median (range) of *n*, %
Obstetric history:	
- Previous deliveries	1 (0 – 2) 1 (1 – 2)
- Previously had a caesarean section delivery	4, 57.1 3, 75
- Previously had complications with vaginal delivery	100% of those who had a vaginal delivery 100% of those who had a vaginal delivery
Maternal characteristics:	
- Age in years	34 (26 – 38) 33 (29 – 37)
- Living with partner	7, 100 4, 100
- Married	6, 85.7 4, 100
- Level of education completed*	Attend postprad (Undergrad degree – Doctorate) Attend postprad (Undergrad degree – Doctorate)
- Household income over the past year in thousands of GBP*	70+ (30 – 70+) 35 (20 – 45)
Infant feeding:	
- Previously breastfed (for any duration)	6, 85.7 4, 100
- Previously breastfed (for $\geq$ 6 weeks)	6, 85.7 4, 100
Ethnicity:	
- White European	6, 85.7 2, 50
- Afro-Caribbean	None 1, 25
- Asian	1, 14.3 1, 25

Infant demographics by the cot group from which the postnatal ward bedsharers derived.

Participants	Bedsharers from side-car crib $n = 7$
	Bedsharers from standalone cot $n = 4$
	Median (range) or *n*, %
Infant characteristics:	
- Female	6, 85.7
	3 , 75
- Gestational age in days	$n = 5$ 276 (274 – 284)
	275 (272 – 276)
- Weight in kilograms	3.54 (3.19 – 4.39)
	3.38 (2.30 – 4.49)
- APGAR at 1 minute	8 (8 –9)
	9 (9)
- APGAR at 5 minutes	9 (9)
	9 (9 – 10)

Maternal-infant sleep during the observation period by the postnatal ward cot type primarily used as the infant sleep location (on-treatment analysis).

Participants	Side-car crib *n* = 13
	Standalone cot *n* = 11
	Maternal bed *n* = 11
	Median (range)
Median proportion observed per hour:	
- Infant awake	0.41 (0.14 – 0.67)
	0.31 (0.08 – 0.82)
	0.40 (0.25 – 0.56)
- Mother awake	0.39 (0.20 – 0.72)
	0.58 (0.28 – 0.85)
	0.44 (0.17 – 0.87)
- Sleep overlap	0.62 (0.34 – 0.82)
	0.48 (0.15 – 0.78)
	0.70 (0.18 – 0.79)
- Mother asleep, infant awake	0.10 (0.00 – 0.23)
	0.09 (0.03 – 0.54)
	0.07 (0.01 – 0.38)
- Infant asleep, mother awake	0.23 (0.07 – 0.56)
	0.40 (0.13 – 0.58)
	0.22 (0.06 – 0.73)

Infant awake, side-car crib versus standalone cot primary use as the postnatal ward infant sleep location: -0.003 (-0.16 – 0.15), p = 0.839; maternal bed versus standalone cot use: 0.02 (-0.12 – 0.17), p = 0797; and maternal bed versus side-car crib use: 0.03 (-0.08 – 0.13), p = 0.664. Mother awake, side-car crib versus standalone cot use: -0.12 (-0.27 – 0.03), p = 0.125; maternal bed versus standalone cot use: -0.11 (-0.28 – 0.05), p = 0.158; and maternal bed versus side-car crib use: 0.007 (-0.14 – 0.16), p = 0.750.

Sleep overlap, side-car crib versus standalone cot use: 0.12 (-0.03 – 0.27, p = 0.111; maternal bed versus standalone cot use: 0.12 (-0.05 – 0.28, p = 0. 123; and maternal bed versus side-car crib use: -0.004 (-0.15 – 0.15), p = 0.794. Mother asleep but infant awake, side-car crib versus standalone cot use: -0.03 (-0.12 – 0.07), p = 0.885; maternal bed versus standalone cot use: -0.002 (-0.12 – 0.12), p = 0.577; and maternal bed versus side-car crib use: 0.02 (-0.07 – 0.11), p = 931. Infant asleep but mother awake, side-car crib versus standalone cot use: -0.09 (-0.23 – 0.05), p = 0.213; maternal bed versus standalone cot use: -0.14 (-0.29 – 0.01), p = 0.071; and maternal bed versus side-car crib use: -0.05 (-0.19 – 0.10), p = 0.469. These p-values were calculated using the Mann-Whitney U test.

Midwifery presence during the observation period by the randomly allocated postnatal ward cot type (intention-to-treat analysis)

Participants	Side-car crib *n* = 19
	Standalone cot *n* = 15
	Median (range)
Median proportion observed per hour:	
- Midwife in	0.003 (0.000 – 0.081)
	0.016 (0.002 – 0.106)

Duration of any breastfeeding among Phase 1 participants – overall and by maternal report of the reasons for breastfeeding intent. [1]

	Week 2	Week 4	Week 8	Week 12	Week 16	Week 20	Week 24
			n, %				
Overall:							
- Breastfeed	*n* = 24 19, 79.2	*n* = 23 14, 60.9	*n* = 23 12, 52.2	*n* = 23 11, 47.8	*n* = 23 11, 47.8	*n* = 22 9, 40.9	*n* = 22 8, 36.4
Breastfeeding intent for infant only:							
- Breastfeed	*n* = 10 6, 60	*n* = 9 4, 44.4	*n* = 9 3, 33.3	*n* = 9 2, 22.2	*n* = 9 2, 22.2	*n* = 8 1, 12.5	*n* = 8 1, 12.5
Breastfeeding intent included for mother:							
- Breastfeed	*n* = 14 13, 92.9	*n* = 14 10, 71.4	*n* = 14 9, 64.3	*n* = 14 9, 64.3	*n* = 14 9, 64.3	*n* = 14 8, 57.1	*n* = 14 7, 50

Duration of any breastfeeding among Phase 2 participants – overall, by maternal report of the reasons for breastfeeding intent and by the randomly allocated postnatal ward cot type (intention-to-treat analysis).

	Week 2	Week 4	Week 8	Week 12	Week 16	Week 20	Week 24
			n, %				
Overall:							
- Breastfeed	*n* = 51 40, 78.4	*n* = 49 35, 71.4	*n* = 49 29, 59.2	*n* = 48 26, 54.2	*n* = 46 21, 45.7	*n* = 45 18, 40	*n* = 43 15, 34.9
Breastfeeding intent for infant:							
- Breastfeed	*n* = 16 13, 81.3	*n* = 15 11, 73.3	*n* = 15 9, 60	*n* = 15 9, 60	*n* = 13 7, 53.8	*n* = 12 6, 50	*n* = 12 6, 50
Breastfeeding intent included for mother:							
- Breastfeed	*n* = 23 20, 87	*n* = 23 18, 78.3	*n* = 23 16, 69.6	*n* = 22 14, 63.6	*n* = 22 11, 50	*n* = 22 10, 45.5	*N* = 21 9, 42.9
Randomly allocated the side-car crib for postnatal ward:							
- Breastfeed	*n* = 30 22, 73.3	*n* = 29 20, 69	*n* = 29 17, 58.6	*n* = 28 15, 54.2	*n* = 27 12, 44.4	*n* = 27 12, 44.4	*n* = 26 11, 42.3
Randomly allocated the standalone cot for postnatal ward:							
- Breastfeed	*n* = 21 18, 85.7	*n* = 20 15, 75	*n* = 20 12, 60	*n* = 20 11, 55	*n* = 19 9, 47.4	*n* = 18 5, 33.3	*n* = 17 4, 23.5

[1] The exclusion of some of the data points is due to the space constraints of this document.

Duration of any breastfeeding among Phase 2 participants by the postnatal ward cot type primarily used as the infant sleep location during the observation period (on-treatment analysis).

	Week 2	Week 4	Week 8	Week 12	Week 16	Week 20	Week 24
			n, %				
Side-car crib use:							
- Breastfeed	*n* = 13 11, 84.6	*n* = 13 10, 79.6	*n* = 13 9, 69.2	*n* = 12 7, 58.3	*n* = 12 6, 50	*n* = 12 6, 50	*n* = 11 5, 45.5
Standalone cot use:							
- Breastfeed	*n* = 11 10, 90.9	*n* = 11 9, 81.2	*n* = 11 7, 63.6	*n* = 11 6, 54.4	*n* = 10 4, 40	*n* = 10 2, 20	*n* = 10 2, 20
Maternal bed use:							
- Breastfeed	*n* = 11 11, 100	*n* = 10 10, 100	*n* = 10 8, 80	*n* = 10 8, 80	*n* = 10 7, 70	*n* = 9 6, 67.6	*n* = 9 5, 62.5

Duration of exclusive breastfeeding among Phase 1 participants – overall and by maternal report of the reasons for breastfeeding intent.

	Week 2	Week 4	Week 8	Week 12	Week 16	Week 20	Week 24
			n, %				
Overall:							
- Breastfeed	*n* = 24 15, 62.5	*n* = 23 11, 47.8	*n* = 23 9, 39.1	*n* = 23 7, 30.4	*n* = 23 5, 21.7	*n* = 23 2, 8.7	*n* = 23 None
Breastfeeding intent for infant only:							
- Breastfeed	*n* = 10 3, 30	*n* = 9 2, 22.2	*n* = 9 1, 11.1	*n* = 9 1, 11.1	*n* = 9 1, 11.1	*n* = 9 None	*n* = 9 None
Breastfeeding intent included for mother:							
- Breastfeed	*n* = 14 12, 85.7	*n* = 14 9, 64.3	*n* = 14 8, 57.1	*n* = 14 6, 42.9	*n* = 14 4, 28.6	*n* = 14 2, 14.9	*n* = 14 None

Duration of exclusive breastfeeding among Phase 2 participants – overall, by maternal report of the reasons for breastfeeding intent and by the randomly allocated postnatal ward cot type (intention-to-treat analysis).

	Week 2	Week 4	Week 8	Week 12	Week 16	Week 20	Week 24
			n, %				
Overall:							
- Breastfeed	*n* = 51 24, 47.1	*n* = 50 18, 36	*n* = 50 13, 26	*n* = 50 13, 26	*n* = 50 9, 18	*n* = 49 5, 10.2	*n* = 49 1, 2
Breastfeeding intent for infant only:							
- Breastfeed	*n* = 16 7, 43.8	*n* = 16 7, 43.8	*n* = 16 5, 31.3	*n* = 16 6, 37.5	*n* = 16 4, 25	*n* = 15 2, 13.3	*n* = 15 None
Breastfeeding intent included for mother:							
- Breastfeed	*n* = 23 12, 52.2	*n* = 23 9, 39.1	*n* = 23 6, 26.1	*n* = 23 6, 23.3	*n* = 23 5, 21.7	*n* = 23 3, 13	*n* = 23 1, 4.3
Randomly allocated the side-car crib for postnatal ward:							
- Breastfeed	*n* = 30 13, 43.3	*n* = 30 10, 33.3	*n* = 30 7, 23.3	*n* = 30 7, 23.3	*n* = 30 6, 20	*n* = 30 3, 10	*n* = 30 1, 3.3
Randomly allocated the standalone cot for postnatal ward:							
- Breastfeed	*n* = 21 11, 53.4	*n* = 20 8, 40	*n* = 20 6, 30	*n* = 20 6, 30	*n* = 20 3, 15	*n* = 19 2, 10.5	*n* = 19 None

Duration of exclusive breastfeeding among Phase 2 participants by the postnatal ward cot type primarily used as the infant sleep location (on-treatment analysis).

	Week 2	Week 4	Week 8	Week 12	Week 16	Week 20	Week 24
			n, %				
Side-car crib use:							
- Breastfeed	*n* = 13 7, 53.8	*n* = 13 5, 38.5	*n* = 13 2, 15.4	*n* = 13 2, 15.4	*n* = 13 2, 15.4	*n* = 13 1, 7.7	*n* = 13 None
Standalone cot use:							
- Breastfeed	*n* = 11 5, 45.5	*n* = 11 4, 36.4	*n* = 11 3, 27.3	*n* = 11 2, 18.2	*n* = 11 None	*n* = 11 None	*n* = 11 None
Maternal bed use:							
- Breastfeed	*n* = 11 8, 72.7	*n* = 10 6, 60	*n* = 10 5, 50	*n* = 10 4, 40	*n* = 10 4, 40	*n* = 9 2, 22.2	*n* = 9 None

Duration of any breastfeeding among Phase 2 participants by any reported home bedsharing.

	Week 2	Week 4	Week 8	Week 12	Week 16	Week 20	Week 24
			n, %				
Overall:							
- Breastfeed	*n* = 51 40, 78.4	*n* = 49 35, 71.4	*n* = 49 29, 59.2	*n* = 47 25, 53.2	*n* = 45 20, 44.4	*n* = 44 17, 38.6	*n* = 42 14, 33.3
Reported bedsharing at some point over the six months:							
- Breastfeed	*n* = 33 28, 84.8	*n* = 32 26, 81.3	*n* = 32 21, 65.6	*n* = 32 21, 65.5	*n* = 31 18, 58.1	*n* = 30 16, 53.3	*n* = 28 13, 46.4
Never reported any bedsharing:							
- Breastfeed	*n* = 14 11, 78.6	*n* = 13 8, 61.5	*n* = 13 7, 53.8	*N* = 12 5, 41.7	*n* = 11 3, 27.3	*N* = 11 2, 18.2	*n* = 11 2, 18.2

Duration of exclusive breastfeeding among Phase 2 participants by any reported home bedsharing.

	Week 2	Week 4	Week 8	Week 12	Week 16	Week 20	Week 24
			n, %				
Overall:							
- Breastfeed	*n* = 51 24, 47.1	*n* = 50 18, 36	*n* = 50 13, 26	*n* = 50 13, 26	*n* = 50 9, 18	*n* = 49 5, 10.2	*n* = 49 1, 2
Reported bedsharing at some point over the six months:							
- Breastfeed	*n* = 33 18, 54.5	*n* = 32 13, 40.6	*n* = 32 10, 31.3	*n* = 32 12, 37.5	*n* = 32 8, 25	*n* = 31 5, 16.2	*n* = 31 1, 3.2
Never reported any bedsharing:							
- Breastfeed	*n* = 14 5, 35.7	*n* = 14 4, 28.6	*n* = 14 2, 14.3	*n* = 14 1, 7.1	*n* = 14 1, 7.1	*n* = 14 None	*n* = 14 None