



Breastfeeding Briefs

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Sleeping with the baby

Guest editor: Helen Ball¹

Who sleeps with their baby, and why?

More babies bed-share in the first few weeks of life than at any other age. On any given night between 20 and 25% of babies under 3 months of age spend some time sharing a bed with a parent and during their first 3 months up to 70% of babies in Euro-American households will have bed-shared once or more.^{2,3,4} When parents are interviewed about sleeping with their baby they give various reasons for doing so.^{5,6,7} Their answers express deeply rooted cultural or religious beliefs and parenting philosophies, invoke the physiological links between lactation and night-time breastfeeding, and reflect the biological compulsion that drives bonding and the urge for close contact. On a practical level they also explain that sleeping with the baby makes night-time care easier, helps them to monitor the baby, provide comfort, and yet obtain sleep. Other parents report having nowhere else to put their baby at night, or that they have fallen asleep with their baby unintentionally. For breastfeeding mothers all of these reasons may apply, and so it is unsurprising that the largest group of bed-sharers around the globe are breastfeeding mothers.

Although it is a well-established fact that the majority of breastfeeding mothers sleep with their babies, the frequency and patterning with which they do so varies. Some do it all night every night, some for part of the night, some only occasionally, and some accidentally fall asleep while feeding without ever meaning to. Although many breastfeeding mothers report having been told that bed-sharing is ‘wrong’⁸, almost every breastfeeding mother sometimes falls asleep with her baby, in bed or in a chair, or on a couch, regardless of whether or not she considers herself to be a ‘bed-sharer’. It is vital, therefore, that all health professionals who support breastfeeding mothers are well informed about the issues surrounding sleep-sharing, and can help new mothers to make sense of how the research evidence relates to their own situations.

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² Blair PS, Ball HL. The prevalence and characteristics associated with parent-infant bed-sharing in England. *Arch Dis Child* 2004;89:1106-10

³ McCoy RC, Hunt CE, Lesko SM et al. Frequency of bed sharing and its relationship to breastfeeding. *J Dev Behav Pediatr* 2004;25:141-9

⁴ Ball H. Airway covering during bed-sharing. *Child Care Health Dev* 2009;35:728-37

⁵ Ball HL. Breastfeeding, bed-sharing, and infant sleep. *Birth* 2003;30:181-8

⁶ Culver ED. Exploring bed-sharing mothers' motives and decision-making for getting through the night intact: a grounded theory. *Journal of Midwifery and Women's Health*. American College of Nurse-Midwives, Silver Spring MD, 2009

⁷ Ateah CA, Hamelin KJ. Maternal bedsharing practices, experiences, and awareness of risks. *J Obstet Gynecol Neonatal Nurs* 2008;37:274-81

⁸ The ‘wrongness’ of bed-sharing may refer to a caution that it is unsafe - bearing the implication that to bed-share is irresponsible - or ‘wrong’ may express a value judgement that parent-infant bed-sharing is morally or culturally inappropriate. However expressed or interpreted, the labelling of bed-sharing as ‘wrong’ is intended to invoke fear or guilt in the parent.

Questions, questions, questions...

Of course, many questions surround parent-infant sleep-sharing (be it in an adult bed, or sleeping together elsewhere). Does it 'cause' SIDS (cot death)? Does it protect babies from SIDS? Do babies get smothered or overlain? Do mothers get more sleep, or less sleep? Is it dangerous to sleep with your baby if you don't breastfeed? What about babies who are very young, or premature, or very small? What if the parents smoke or drink? Does sleep-sharing help mothers to breastfeed? Does breastfeeding protect babies from sleep-sharing risks? Where should you feed at night? Is it better to feed sitting up at night or lying down? How do you bed-share? Can you make the bed safe?

The issues surrounding bed-sharing are not simple, and so many of the questions posed do not have simple answers. The research evidence is contradictory, and so is the guidance issued by different organisations. Most of the questions are also not easy to research, because bed-sharing is difficult to disentangle from many other aspects of parenting that contribute to various outcomes – and very little research into bed-sharing risks considers breastfed and non-breastfed infants separately. What we know, therefore, is incomplete, and guidance comes with a certain 'spin' that reflects the remit or priorities of the organisation providing the guidance.⁹ Parents therefore have to use their judgement in determining what works, or is 'best', or is 'safest', for them and their baby – and they need information in order to do so.

Over the past year, my colleague Dr Charlotte Russell and I have been working with several organisations in the UK (La Leche League, National Childbirth Trust, UNICEF Baby Friendly Initiative) to produce an infant sleep information website (ISIS) that aims to inform parents and health care providers about the research evidence available on where and how babies sleep (www.isisonline.org.uk). This editorial will summarise some of the issues we discuss on the site, and consider how the latest research is informing parents and healthcare providers.

Why is bed-sharing considered dangerous?

There is a long history to the discussion of infant sleep and safety that begins in our evolutionary past. When I talk to public audiences I often explain the evolutionary characteristics of human infants and why human mothers and infants require close physical contact with one another in the first few months of life. Because human babies are not completely developed at birth, they need to be closely protected for several weeks, need to be fed often, including at night. My intention is to explain why mothers often feel a need to sleep with their babies, and why babies respond positively to close contact. Although this sleep contact is a part of our evolved biology, it does not mean it is without risk. I sometimes see biological explanations used as an argument to dismiss safety concerns (e.g. "other mammals sleep with their babies without hurting them"). While it is absolutely the norm among mammals for mothers and their offspring to sleep in close contact, we should remember that it is also common in nature for mammals to die in infancy. Likewise infant mortality has occurred at a high rate throughout human history and babies have died while sleeping with their mothers, for reasons that could be accidental, deliberate, or unrelated to where the baby slept. One aspect of infant mortality that came under early scrutiny was death due to overlying, which in the European Middle Ages was considered to be covert infanticide,¹⁰ and then in 19th century Scotland was linked to maternal alcohol consumption.¹¹ To eliminate deliberate or accidental overlying deaths the arcuccio was invented in Italy to protect infants from their sleeping mothers.¹² (Figure 1)

⁹ Ball HL, Volpe LE. Sudden Infant Death Syndrome (SIDS) risk reduction and infant sleep location - Moving the discussion forward. *Soc Sci Med* 2012; doi:10.1016/j.socscimed.2012.03.025

¹⁰ Spinelli MG. *Infanticide: psychosocial and legal perspectives on mothers who kill*. American Psychiatric Publishing, Arlington VA, 2003

¹¹ Russell-Jones DL. Sudden infant death in history and literature. *Arch Dis Child* 1985;60:278-81

¹² <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2508215/pdf/brmedj08781-0040.pdf>

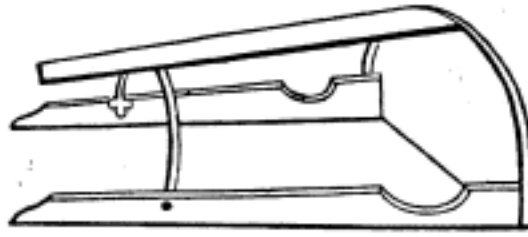


Figure 1. The Arcuccio: an apparatus to prevent the overlying of infants. *British Medical Journal*, August 10, 1895.

In other countries devices long used for infant carrying and daytime infant sleep (e.g. cradles and baskets) became co-opted as night-time infant sleep spaces as, with increasing prosperity, houses expanded and private bedrooms became fashionable. These influences have resulted in culturally-derived infant sleep practices in many post-industrial nations that are now out of step with mother-infant evolved biology. This discordance between the recent cultural history and the evolved history of infant care is at the root of the bed-sharing issue.

As living standards and hygiene improved in prosperous countries during the 19th and 20th centuries, infant death rates declined to what are now their lowest points ever. One goal of western medicine – to eliminate all preventable infant death – has been pursued extremely successfully in such settings, and as medical knowledge advanced, doctors with incubators and artificial feeding methods at their disposal could keep babies alive without a mother. Eventually mothers became superfluous to their infants' survival. By the mid-20th century western infants predominantly slept in their own room, in specially designed furniture, and were fed chemically modified cow's milk formula. But although the presumed dangers of mothers' sleeping bodies were now absent, inexplicably, babies still died in their cribs, a phenomenon that became colloquially known as cot or crib death. Today Child Death Review Panels, Infant Mortality Boards, and Safeguarding Committees are prominent in many countries, and stringently examine every infant and child death in pursuit of future prevention.

Introducing SIDS...

From 1965 the unexpected death of an infant for which no cause could be found at post-mortem was classified as Sudden Infant Death Syndrome (SIDS) with a new code incorporated into the International Classification of Disease. SIDS, therefore, is not a cause from which babies die, but a category to which they are assigned if no cause can be found for their death. The search for the mechanisms underlying these deaths has so far been unsuccessful; it is still not known why babies die unexpectedly in their sleep. However, certain circumstances have been found to be associated with SIDS, such as prone sleep position, exposure to smoking, and lack of breastfeeding. These circumstances are commonly known as risk factors, and when multiple risk factors affect a single infant the risk of SIDS dramatically increases. Some risk factors are associated with intrinsic infant vulnerability, such as premature birth, low birth weight, or prenatal smoke exposure. Once a baby has been born these factors cannot be altered. However, other factors are related to the environment of infant care and are thought to provide a stressor that a vulnerable baby experiencing a critical period of development may be unable to overcome, the so-called "triple-risk SIDS model" (Figure 2).¹³ These aspects of infant care are generally considered to be 'modifiable' risks (e.g. sleep position, over-wrapping, head-covering, feeding, pacifier use, parental smoking) and form the basis of many national SIDS prevention campaigns. A large measure of success has been achieved with some simple campaigns (such as

¹³ Filiano JJ, Kinney HC. A perspective on neuropathologic findings in victims of the sudden infant death syndrome: the triple-risk model. *Biol Neonate* 1994;65:194-7

“Back to Sleep”), but such ‘magic bullets’ are rare and may actually now be hindering further SIDS reduction efforts.¹⁴

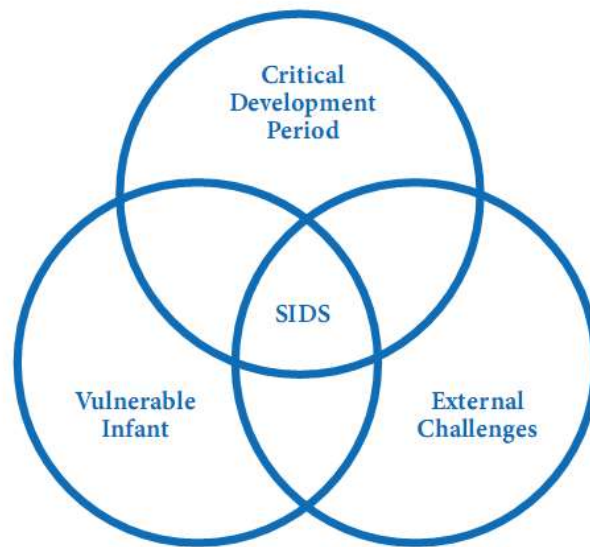


Figure 2. The triple-risk SIDS model.

...and bed-sharing

In 1986, anthropologist James McKenna hypothesised that one explanation for SIDS may involve the separation of babies from their mothers at night, a feature of infant care in certain western countries that is historically and cross-culturally unique.¹⁵ SIDS research at the time implicated suppressed infant arousals and breathing pauses (central apnoea) as potential precursors to unexpected infant deaths, and McKenna proposed that infants sleeping in the sensory-rich environment of close sleep contact may be protected from apnoeic pauses and lack of arousal by maternal sounds, movements, and breathing.¹⁶ This was a popular hypothesis that many parents embraced, particularly those who already valued sleep contact with babies for the philosophical or practical reasons mentioned above. Although McKenna’s research demonstrated the existence of a high degree of physiological synchrony between sleeping mothers and babies,¹⁷ research on shared sleep environments indicated that bed-sharing was another factor associated with increasing rather than decreasing risk of SIDS, and that the combination of bed-sharing with a parent who smokes was particularly implicated.^{18,19} For the past 20 years, discussion and studies regarding the real and presumed risks and benefits of bed-sharing have been on-going. No epidemiological studies have produced evidence that bed-sharing definitely reduces SIDS-risk, although there is strong evidence that co-sleeping (baby room-

¹⁴ Ball HL, Volpe LE. Sudden Infant Death Syndrome (SIDS) risk reduction and infant sleep location - Moving the discussion forward. *Soc Sci Med* 2012; doi:10.1016/j.socscimed.2012.03.025

¹⁵ McKenna JJ. An anthropological perspective on the sudden infant death syndrome (SIDS): the role of parental breathing cues and speech breathing adaptations. *Med Anthropol* 1986;10:9-92

¹⁶ McKenna JJ, Mosko S, Dungy C, McAninch J. 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). *Am J Phys Anthropol* 1990;83:331-47

¹⁷ McKenna JJ, Ball HL, Gettler LT. Mother-infant cosleeping, breastfeeding and sudden infant death syndrome: what biological anthropology has discovered about normal infant sleep and pediatric sleep medicine. *Am J Phys Anthropol* 2007;Suppl 45:133-61

¹⁸ Mitchell EA, Scragg R. Are infants sharing a bed with another person at increased risk of sudden infant death syndrome? *Sleep* 1993;16:387-9

¹⁹ Blair PS, Fleming PJ, Smith IJ et al. Babies sleeping with parents: case-control study of factors influencing the risk of the sudden infant death syndrome. CESDI SUDI research group. *BMJ* 1999;319:1457-61

sharing with parent(s) for sleep) is protective. It is also now clear that certain behaviours and environments interact to make some forms of adult-infant sleep-sharing particularly hazardous.

What are the risks?

Studies on the association between bed-sharing and SIDS have been contradictory, with some finding evidence of an increased risk between bed-sharing and SIDS only for the infants of smokers, and others finding the same association for non-smokers also. This has led to some countries and organisations advising parents to *never* bed-share, and others to avoid bed-sharing *under certain circumstances*. The research evidence was recently reviewed in a meta-analysis that examined the data from 11 national case-control studies with data on SIDS and sleep location conducted between 1987 and 2006.²⁰ Three studies were from the US, four from the UK, one each from Germany, Ireland, New Zealand and Norway. The review used a broad definition of bed-sharing that encompassed the sharing of *any sleep surface* between adults and young children. Overall, the risk for SIDS increased almost three times for bed-sharing in any sleep surface. Maternal smoking data were only available from four studies producing a six-fold increase in risk for maternal smoking and bed-sharing (any sleep surface), compared to a 1.66 increase for non-smoking mothers, indicating a significantly increased risk only for smokers. Data on infant age and bed-sharing (any sleep surface) were available from just three studies and were examined for all cases, regardless of smoking status. The risk for infants less than 12 weeks old was about 10 times higher than for infants 12 weeks and older. However, without a further breakdown by smoking status, and no information on the type of sleep surface (e.g. bed vs. sofa), this apparent increased risk for younger infants is difficult to contextualise. It should also be remembered that the 12 week age-bracket is an arbitrary cut-off point and the definition of a ‘young infant’ varies from study to study. In two studies routine bed-sharing (any sleep surface) was not associated with SIDS, but five studies revealed a SIDS increase of over two-fold when sleep-sharing was not part of routine practice. Although described as a meta-analysis of 11 studies, only the overall risk of SIDS in relation to ‘bed-sharing’ actually incorporates data from the full-range of studies examined. Where subgroup analyses were undertaken these involved data from fewer than half the studies at best, and variables were examined in isolation from one another. It is frustrating to not have clear information on whether smoking status, or non-routine sleep-sharing, presents a disproportionately greater risk for young infants, or what the contribution of sofa-sharing or alcohol consumption might be in this apparently vulnerable age-group.

While this recent meta-analysis predominantly reviewed data that are now fairly old (including data from before and during the Back to Sleep campaigns, and the dramatic fall in SIDS deaths during the 1990s), more recent studies provide further insights. Where SIDS prevention guidance has emphasised cot/crib safety (supine sleep, avoidance of head covering and over-wrapping, removal of duvets, soft toys and bumpers, etc.) the rate of SIDS occurring in cots has fallen. Researchers are now beginning to apply the same principles to identifying factors involved in bed-sharing safety. Sleep location was examined in England by SWISS (South West Infant Sleep Study),²¹ a 4-year population-based case-control study that compared 80 infant deaths meeting the criteria for SIDS with data from two age-matched control groups. The term ‘co-sleeping’ was used to define any sleep-sharing between an adult and baby on a bed or a sofa. Among the SIDS infants, 54% died while co-sleeping compared with 20% who shared the reference sleep in both control groups. A significant interaction was found for infant deaths between co-sleeping and recent parental use of alcohol or drugs (31% vs. 3% random controls) and co-sleeping on a sofa (17% vs. 1%). The authors concluded that many of the SIDS infants had slept with an adult in a hazardous environment. The major influences on risk, regardless of markers for socioeconomic deprivation, were the use of alcohol or drugs

²⁰ Vennemann MM, Hense HW, Bajanowski T et al. Bed sharing and the risk of sudden infant death syndrome: can we resolve the debate? *J Pediatr* 2012;160:44-8

²¹ Blair PS, Sidebotham P, Evason-Coombe C, Edmonds M, Heckstall-Smith EM, Fleming P. Hazardous cosleeping environments and risk factors amenable to change: case-control study of SIDS in south west England. *BMJ* 2009;339:b3666

before sharing a bed, and sofa-sharing. Although data on whether or not mothers ‘attempted to breastfeed’ were compared for cases and controls, no association was found with SIDS, however more specific data on infant feeding type at time of death or reference sleep were not reported. It is now clear which characteristics of the shared sleep environment increase the risk of SIDS – smoking, alcohol and drug use, and sleeping with a baby on a sofa – and often these occur in combination. A study of bed-sharing infant deaths in Alaska, for instance,²² found that in 99% of cases, at least one risk factor was present (e.g. maternal tobacco use; sleeping with a person impaired by consumption of some substance affecting awareness or arousal) and concluded that bed-sharing alone does not increase the risk of infant deaths.

What about accidental infant deaths such as suffocation and overlying?

In addition to SIDS that may occur during bed-sharing, there is a growing literature on sleep location and accidental sudden unexpected death in infancy (SUDI). Distinguishing between SIDS and accidental SUDI has always been difficult due to the absence of clear diagnostic criteria for separating SIDS and soft suffocation. Where evidence for potential suffocation is circumstantial (e.g. presence of a sleep-partner) coroners may designate an infant death as ‘unascertained’. Shared sleep environments have been implicated in infant suffocation deaths in recent UK and US studies.^{23,24} Therefore, in addition to the issue of whether bed-sharing carries an increased SIDS-risk in a given context, all parents should be alert to the possibility of accidental infant deaths when sleep-sharing. Parental responsibility is an important issue for both SIDS and accidental SUDI. If parents have considered safety issues related to bed-sharing in advance of sleeping with their baby for the first time, the risks of accidentally falling asleep with the baby in a hazardous environment can be modulated. This is particularly important when alcohol and/or other drugs temporarily impair parental judgement, since it is a sober adult that should be making the decision about a baby’s safety.

Breastfeeding and bed-sharing: what do we know?

Research confirms what breastfeeding mothers often report: that bed-sharing facilitates frequent night-time breastfeeding. Various studies have found that although bed-sharing breastfeeding mothers wake frequently to feed, they also wake for shorter periods, fall back to sleep more rapidly,²⁵ and achieve greater sleep duration,²⁶ when compared to not bed-sharing. Recently a Swedish study reported an association between bed-sharing and three or more night-time wakings, but interpreted this as an association with sleep problems rather than as the need of breastfed infants to feed frequently, including at night.²⁷ Although the same authors reported an association in Sweden between bed-sharing and being a single parent, in the UK we found the opposite association with fewer single mothers bed-sharing than those who were cohabiting.²⁸ Other studies have determined that breastfeeding is associated with greater or equivalent sleep duration than formula feeding in general, but have not examined sleep location.^{29,30}

²² Blabey MH, Gessner BD. Infant bed-sharing practices and associated risk factors among births and infant deaths in Alaska. *Public Health Rep* 2009;124:527-34

²³ Weber MA, Risdon RA, Ashworth MT, Malone M, Sebire NJ. Autopsy findings of co-sleeping-associated sudden unexpected deaths in infancy: relationship between pathological features and asphyxial mode of death. *J Paediatr Child Health* 2012;48:335-41

²⁴ Schnitzer PG, Covington TM, Dykstra HK. Sudden unexpected infant deaths: sleep environment and circumstances. *Am J Public Health* 2012;102:1204-12

²⁵ Mosko S, Richard C, McKenna J. Maternal sleep and arousals during bedsharing with infants. *Sleep* 1997;20:142-50

²⁶ Quillin SI, Glenn LL. Interaction between feeding method and co-sleeping on maternal-newborn sleep. *J Obstet Gynecol Neonatal Nurs* 2004;33:580-8

²⁷ Mollborg P, Wennergren G, Norvenius SG, Alm B. Bed-sharing among six-month-old infants in western Sweden. *Acta Paediatr* 2011;100:226-30

²⁸ Ball HL, Moya E, Fairley L, Westman J, Oddie S, Wright J. Bed- and sofa-sharing practices in a UK biethnic population. *Pediatrics* 2012;129:e673-e681

²⁹ Doan T, Gardiner A, Gay CL, Lee KA. Breast-feeding increases sleep duration of new parents. *J Perinat Neonatal Nurs* 2007;21:200-6

The close interaction between breastfeeding and bed-sharing has now been documented in 20 or more studies. Of particular interest is the observed association between bed-sharing and greater duration of breastfeeding. In Brazil, for instance, researchers investigated breastfeeding outcomes at 12 months by interviewing mothers of 4'231 infants at birth, 3 and 12 months about their breastfeeding and bed-sharing characteristics. Bed-sharing was defined as habitual sharing of a bed between mother and child for all or part of the night. Breastfeeding prevalence at 12 months was 59% for those who bed-shared at 3 months and 44% for those who did not. Among infants exclusively breastfed at 3 months, 75% of bed-sharers were still breastfed at 12 months, versus 52% of non-sharers.³¹ The authors accepted these results as evidence that bed-sharing protected against early weaning; however the association tells us nothing about the direction of causality. The relationship may simply be that mothers who are inclined to breastfeed for longer may also be more inclined to bed-share.

Several years ago we found a significant difference in breastfeeding frequency and infant sleep location when we conducted a randomised video study on the first two nights following birth in a hospital postpartum unit.³² Babies who shared their mother's bed, or slept in a side-car crib attached to the bed fed more than twice as frequently as babies who slept in a standard bassinet by the mothers' bed. Video footage indicated that when babies woke during the night and began rooting for the breast, mothers in close proximity were alert to their feeding cues and responded promptly; however mothers whose babies were in a bassinet at their bedside did not feel their infants' movements or respond to their cues. These babies therefore missed many opportunities to initiate and practice latching and suckling, while the mothers did not receive the frequent nipple stimulation and prolactin surges that trigger prompt and copious milk production.

In a subsequent trial,³³ we hypothesised that as sleep contact between mother and baby had been found to increase breastfeeding frequency, and because frequent breastfeeding is known to promote effective lactation, mothers and babies who were encouraged to sleep in close proximity following delivery may experience a longer duration of breastfeeding than those who slept apart but in the same room. In this trial we randomised mothers and newborn infants to two different sleep conditions during their post-partum hospital stay. 1'204 pregnant women with an intention to breastfeed were recruited at a large UK hospital. Half were randomly allocated to normal rooming-in (stand-alone cot at bedside); the other half were allocated to close-contact (side-car crib clamped to the mother's bed-frame). Following hospital discharge mothers reported weekly on their breastfeeding status and infant at-home sleep location; 870 mothers provided data for up to 6 months. Adjusting for maternal age, education, delivery type, and previous breastfeeding, we found no significant difference between the groups for duration of any or exclusive breastfeeding. Although we did not find that postnatal sleep proximity affected long-term breastfeeding outcomes in a busy tertiary hospital setting, the follow-up data reinforced the findings of previous studies. Bed-sharing at home was common (reported by 67% of side-car recipients vs. 64% of those rooming-in during postnatal stay), and those who bed-shared in the first 13 weeks were twice as likely than non-sharers to breastfeed to 6 months (unpublished data). The short duration of current UK post-partum hospitalisation means the directionality of the association now needs examining in the home, but how to randomise mothers and infants to different sleep locations (and ensure compliance) in a domestic setting is a methodological problem still to be solved!

³⁰ Montgomery-Downs HE, Clawges HM, Santy EE. Infant feeding methods and maternal sleep and daytime functioning. *Pediatrics* 2010;126:e1562-e1568

³¹ Santos IS, Mota DM, Matijasevich A, Barros AJ, Barros FC. Bed-sharing at 3 months and breast-feeding at 1 year in southern Brazil. *J Pediatr* 2009;155:505-9

³² Ball HL, Ward-Platt MP, Heslop E, Leech SJ, Brown KA. Randomised trial of infant sleep location on the postnatal ward. *Arch Dis Child* 2006;91:1005-10

³³ Ball HL, Ward-Platt MP, Howel D, Russell C. Randomised trial of sidecar crib use on breastfeeding duration (NECOT). *Arch Dis Child* 2011;96:630-4

Overall, to date we know that when new breastfeeding mothers bed-share they are more aware of and responsive to their infants' feeding cues, which assists with breastfeeding initiation. In the weeks and months following birth, breastfeeding mothers commonly bed-share to make night-time feeding easier to manage, and those who bed-share sleep more and breastfeed for longer than those who sleep apart. This may be an important suggestion for working mothers who continue to breastfeed once they return to work or decide to stop breastfeeding because they are soon returning to work. Even if they wake more often during the night to breastfeed their infant, in general they sleep as many hours or more than non co-sleepers (an advantage for themselves), and they continue to breastfeed for an overall longer period (an advantage for their baby).

Now we must consider the degree to which the benefits of bed-sharing for breastfeeding mothers and babies are offset by real or presumed risks.

Breastfeeding, bed-sharing, and risks

Breastfed babies are sometimes the victims of SIDS, although SIDS deaths are less frequent among babies who are breastfed than those who are not. A meta-analysis of breastfeeding and SIDS confirmed that breastfed babies had less than half the risk of SIDS than those who were not breastfed, and that the effect was stronger when breastfeeding was exclusive.³⁴ However, no SIDS case control studies have determined the SIDS risk of bed-sharing in an adult bed by currently breastfeeding infants in the absence of the well-established risks (smoking, alcohol use and drug consumption), with the exception of a study in the Netherlands whose results are considered inconclusive because of the small sample, the lack of breakdown by breastfeeding status and the lack of data on other risk factors;³⁵ for all these reasons, this study was excluded from the above meta-analysis. Other researchers have produced estimates in attempts to address the same issue. Carpenter used data from 20 regions in Europe to estimate that the SIDS-rate for breastfed, bed-sharing infants would be twice that of breastfed non-bed-sharing infants, reflecting an increase from 1 to 2 per 10'000 in the cumulative number of deaths estimated by 6 months of age.³⁶ The same estimates for non-breastfed infants produced rates of 4/10'000 and 11/10'000 for not bed-sharing and bed-sharing respectively. Compared to the UK national SIDS-rate of 1/2'000, both the estimates for breastfed infants, either in or out of the bed-sharing environment, are therefore very low, and an excess risk for non-breastfed babies who bed-share is indicated.

In an examination of the patterns of bed-sharing and breastfeeding over time between birth and 45 months of age for 14'000 families from the ALSPAC (Avon Longitudinal Study of Parents and Children) cohort study (infants born in 1991 and 1992), latent class analysis (a powerful multivariate statistical method that identifies unobservable subgroups within a population) was used to identify groups of families based on their bed-sharing characteristics.³⁷ The authors conclude that families most likely to bed-share in the months following birth were also those most likely to breastfeed, and that the characteristics of these families placed them at very low risk of SIDS. Any benefit from preventing bed-sharing in this group, therefore, would be very small, and by following such advice breastfeeding would probably suffer. The authors recommend that risk reduction messages to prevent SIDS be targeted specifically to *unsafe* infant care practices; in this way infant mortality prevention would avoid undermining breastfeeding outcomes for those infants already at low risk of unexpected death.

³⁴ Hauck FR, Thompson JM, Tanabe KO, Moon RY, Vennemann MM. Breastfeeding and reduced risk of sudden infant death syndrome: a meta-analysis. *Pediatrics* 2011;128:103-10

³⁵ Ruys JH, de Jonge GA, Brand R, Engelberts AC, Semmekrot BA. Bed-sharing in the first four months of life: a risk factor for sudden infant death. *Acta Paediatr* 2007;96:1399-403

³⁶ Carpenter RG, Irgens LM, Blair PS et al. Sudden unexplained infant death in 20 regions in Europe: case control study. *Lancet* 2004;363:185-91

³⁷ Blair PS, Heron J, Fleming PJ. Relationship between bed sharing and breastfeeding: longitudinal, population-based analysis. *Pediatrics* 2010;126:e1119-e1126

Balancing information

The challenge of balancing the public health benefits of exclusive breastfeeding to 6 months of age with the safeguarding/infant mortality agenda of preventing all infant deaths will require creative solutions. Breastfeeding cannot protect an infant from risks introduced by hazardous parental behaviour, and so guidance that infants are safest sleeping in a crib next to their parents' bed is defensible as a general public health message; but this message must also acknowledge that not all parent-infant bed-sharing is inherently dangerous, and that breastfeeding bed-sharing mothers and infants are a particularly low-risk group. It is therefore not defensible to advise or imply that bed-sharing is lethal and should never be practiced under any circumstances and, to do so is also alienating. Recent data from the US, where fear-tactics have been implemented in anti-bed-sharing campaigns, indicate that simple messages designed to demonise bed-sharing are rejected by the parents at whom they are targeted.³⁸ In Milwaukee, the infamous butcher's knife and tombstone messages posted on billboards, have failed to produce a sustained reduction in infant mortality in the highest risk groups.³⁹ (Figure 3) Cultural infant care traditions and personal parenting beliefs that incorporate bed-sharing as a valued component of parenting will not respond to campaigns that treat sleep contact as a modifiable risk factor or simple infant care practice (such as sleep position). In a recent publication, I argue that much bed-sharing research has so far failed to recognise the importance of infant sleep location to ethnic and sub-cultural identity.⁴⁰ We include breastfeeding mothers as a particular sub-cultural group who reject many of the dominant ideologies regarding infant care and particularly mother-infant separation, and we call for more sensitive and targeted information alongside the continued pursuit of detailed research that helps in the development of more nuanced guidance regarding bed-sharing. This is the kind of information we aim to make available on the ISIS website. Please let us know how we're doing (www.isisonline.org.uk).



Figure 3. Images from the Milwaukee campaign against SIDS.

³⁸ Ball HL, Volpe LE. Sudden Infant Death Syndrome (SIDS) risk reduction and infant sleep location - Moving the discussion forward. Soc Sci Med 2012; doi:10.1016/j.socscimed.2012.03.025

³⁹ <http://www.jsonline.com/news/milwaukee/milwaukee-infant-mortality-rate-drops-overall-but-disparity-worsens-sp54t7f-148680905.html>

⁴⁰ Ball HL, Volpe LE. Sudden Infant Death Syndrome (SIDS) risk reduction and infant sleep location - Moving the discussion forward. Soc Sci Med 2012; doi:10.1016/j.socscimed.2012.03.025

Abstracts

Bed sharing, breastfeeding and sudden infant death

Blair PS, Heron J, Fleming PJ. Relationship between bed sharing and breastfeeding: longitudinal, population-based analysis. *Pediatrics* 2010;126:e1119-e1126

This study used prospective, population-based data from the Avon Longitudinal Study of Parents and Children in the United Kingdom to investigate nocturnal bed sharing at 0-2, 6-8, 17-20, 30-33 and 42-45 months of age, and its relationship with breastfeeding. Of 14'062 live births recorded between April 1991 and December 1992, 7'447 (53%) had data available for all time points. Latent class analysis, a multivariate statistical method that identifies unobservable subgroups within a population, identified four mutually exclusive groups: non sharers (66%), early bed sharers (only in infancy) (13%), late bed sharers (after the first year) (15%), and constant bed sharers (throughout the 4 years) (6%). Higher maternal education and social class were positively associated with early bed-sharing, negatively associated with late bed-sharing, and not associated with constant bed-sharing. Late bed sharers had a 72% higher probability of breastfeeding at 12 months, early bed-sharers breastfed almost 2.5 higher more, and constant bed-sharers 5.3 times more, compared to non bed-sharers. The prevalence of breastfeeding was significantly higher among the groups that shared beds constantly or early for each of the first 15 months after birth. The authors conclude that advice on whether bed-sharing should be discouraged needs to take into account the important relationship with breastfeeding.

Trachtenberg FL, Haas EA, Kinney HC, Stanley C, Krous HF. Risk factor changes for Sudden Infant Death Syndrome after initiation of Back-to-Sleep campaign. *Pediatrics* 2012;129:630-8

This study used the records of 568 SIDS deaths occurred in San Diego, USA, from 1991 to 2008 to test the hypothesis that age, prevalence and pattern of risk factors changed after initiation of the Back-to-Sleep (BTS) campaign in 1994. Risks were divided into intrinsic (e.g., male gender, prematurity, prenatal exposure to cigarette smoke or alcohol) and extrinsic (e.g., prone sleeping, bed sharing, over-bundling, soft bedding). Between 1991-1993 and 1996-2008, the percentage of SIDS infants found prone decreased from 84% to 49%, bed-sharing increased from 19% to 38%, especially among infants less than 2 months (29% vs. 64%), prematurity increased from 20% to 29%, whereas symptoms of upper respiratory tract infection decreased from 47% to 25%. Ninety-nine percent of SIDS infants had at least one risk factor, 57% had at least two extrinsic and one intrinsic risk factor, and only 5% had no extrinsic risk. The average number of risks per SIDS

infant did not change after initiation of the BTS campaign. SIDS infants in the BTS era show more variation in risk factors. There was a consistently high prevalence of both intrinsic and especially extrinsic risks both before and during the BTS campaign. Risk reduction campaigns emphasizing the importance of avoiding multiple and simultaneous SIDS risks are essential to prevent SIDS, including among infants who may already be vulnerable.

Ball HL, Moya E, Fairley L, Westman J, Oddie S, Wright J. Infant care practices related to sudden infant death syndrome in South Asian and White British families in the UK. *Pediatr Perinat Epidemiol* 2012;26:3-12

In the UK, infants of South Asian parents have a lower rate of SIDS than white British infants. Infant care and life style behaviours are strongly associated with SIDS risk. This paper describes and explores variability in infant care between white British and South Asian families (of Bangladeshi, Indian or Pakistani - the vast majority - origin) in Bradford, and identifies areas for targeted SIDS intervention. A cross-sectional telephone interview study was conducted involving 2'560 families with 2- to 4-month-old singleton infants. Outcome measures were prevalence of self-reported practices in infant sleeping environment, sharing sleep surfaces, breastfeeding, use of pacifier and life-style behaviours. It was found that, compared with white British infants, Pakistani infants were more likely to sleep in an adult bed 8.5 times, to be positioned on their side for sleep 4.4 times, to have a pillow in their sleep environment almost 10 times, to sleep under a duvet 3.2 times, to be swaddled for sleep 1.5 times, to ever bed-share 2 times, to regularly bed-share 3.5 times, to have been ever breastfed 2 times, and to have been breastfed for 8 weeks or more 1.6 times. In addition, Pakistani infants were 95% less likely to sleep in a room alone, 65% to use feet-to-foot position, 48% to sleep with a soft toy, 80% to use an infant sleeping bag, 78% to ever sofa-share, 78% to be receiving solid foods, and 60% to use a pacifier at night. Pakistani infants were also 93% less likely to be exposed to maternal smoking and to alcohol consumption by either parent. No difference was found in the prevalence of prone sleeping. Night-time infant care, therefore, differed significantly between South Asian and White British families. South Asian infant care practices were more likely to protect infants from the most important SIDS risks such as smoking, alcohol consumption, sofa-sharing and solitary sleep. These differences may explain the lower rate of SIDS in this population.

Ball HL, Moya E, Fairley L, Westman J, Oddie S, Wright J. Bed- and sofa-sharing practices in a UK biethnic population. *Pediatrics* 2012;129:e673-e681

In the United Kingdom, as in the United States and New Zealand, bed-sharing is a cultural practice among particular ethnic minority groups. The authors carried out a cohort study in UK Pakistani and white British population aiming to describe cultural differences in bed and sofa-sharing, associated with breastfeeding practices. 3082 mothers with single births were interviewed when their babies were aged 2 to 4 months, showing that 15.5% of families had ever bed-shared; 7.2% of families regularly bed-shared and 9.4% had ever sofa-shared, while 1.4% reported both. Potential risk factors were controlled and statistical analysis was performed. The results showed an association between (especially regular) bed-sharing and breastfeeding, suggesting that bed-sharing is more common among white British than Pakistani mothers who breastfeed more than 8 weeks. The authors conclude that caution is needed in making recommendations regarding avoidance of bed-sharing, which does not appear to carry the same risk for all families, and can lead to adoption of more risky strategies, such as sofa-sharing, and to reduce breastfeeding.

Gettler LT, McKenna JJ. Evolutionary perspectives on mother-infant sleep proximity and breastfeeding in a laboratory setting. *American Journal of Physical Anthropology* 2011;144:454-62

The authors of this well-defined and processed study observed and filmed 36 mother-infant pairs over a 3-night period in a laboratory-setting in California. Participants in the “bed-sharing dyads” group (n=20) slept, mother and child, on the same surface (as they did routinely at home), while participants in the group of “solitary sleeping dyads” (n=16) slept in separate rooms (also as at home). All infants were breastfed on demand. Mothers and infants were selected following a thorough process based on numerous criteria for both mothers (Latina, under 38 years, no alcohol, cigarette or drug use history, prenatal care...) and infants (7-18 weeks of age, good health, normal development, normal gestational age, AGPAR score 8 or above...). During the first night, as hypothesized by the authors, participants in the bed-sharing group fed more often and at shorter intervals between feeds than those in the solitary sleeping group (respectively 4.5 and 2.6 times per night at intervals of 116.2 and of 161.9 minutes). There were no notable differences between male and female infants. A particular novelty of the study was that participants were filmed, thus allowing for more objectivity. The video-taping showed how physical proximity enhanced awakening and facilitated breastfeeding episodes. The discussion led by the authors in the article is of particular interest as they explain the anthropological context of bed-sharing: all mammal mothers sleep with their offspring; the human being is less developed at birth than other mammals and requires constant protection, proximity and feeding; at birth the infant’s

brain is only 25% that of the adult’s and develops through regular feeding; human babies acquire more than 50% of their nutritional needs during night feeds; human milk is low in fat and proteins which explains the need to feed often. They also introduce a historical and cultural perspective: systematic efforts to separate mothers from infants at night-time are recent and mostly a Western world phenomenon; more than 65% of breast-feeding mothers in the UK bed-share for some time during the baby’s first weeks of life despite efforts to constrain this. The authors’ conclusions are important for breastfeeding advocates: 1) research on breastfeeding initiation and duration should include data on sleep practices as mother-infant proximity - including during the night - does seem to directly influence breastfeeding length and exclusive breastfeeding; 2) solitary sleep, a culturally-guided phenomenon, is not neutral and influences infant health and development; 3) in contexts where mothers and infants are separated during long daytime periods (working mothers for example) it may be particularly important that infants sleep in close proximity to their mothers in order to easily breastfeed on demand and thus obtain the necessary nutritional, energetic and immunological benefits of their mother’s milk.

Baddock SA, Galland BC, Bolton DPG, Williams SM, Taylor BJ. Hypoxic and hypercapnic events in young infants during bed-sharing. *Pediatrics* 2012; 130:237-44

The objective of this study was to identify de-saturation events (arterial oxygen saturation [SaO₂] less than 90%) and rebreathing events (inspired carbon dioxide (CO₂) more than 3%), in bed-sharing (BS) versus cot-sleeping (CS) infants. Forty healthy, term infants, aged 0 to 6 months who regularly bed-shared with at least one parent more than 5 hours per night and 40 age-matched CS infants were recruited in Dunedin, New Zealand. Overnight parent and infant behaviour (via infrared video), SaO₂, inspired CO₂ around the infant’s face, and body temperature were recorded during sleep at home over two consecutive nights. De-saturation events were twice as common in BS infants, associated partly with the warmer micro-environment during BS. More than 70% of de-saturations in both groups were preceded by central apnoea of 5 to 10 seconds with no accompanying bradycardia, usually in active sleep. Apnoea lasting more than 15 seconds was rare (BS infants: three events; CS infants: 6 events), as was de-saturation to less than 80% SaO₂ (BS infants: three events; CS infants: four events). Eighty episodes of rebreathing were identified from 22 BS infants and 1 CS infant, almost all preceded by head covering. During rebreathing, SaO₂ was maintained at the baseline of 97.6%. All BS and CS infants were at low risk of SIDS and maintained normal oxygenation. More research is needed on the effect of repeated exposure to oxygen de-saturation in vulnerable infants and on the ability of these infants to respond effectively to rebreathing caused by head covering.

Morgan BE, Horn AR, Bergman NJ. Should neonates sleep alone? *Biol Psychiatry* 2011;70:817-25

This study was carried out to investigate the impact of maternal-neonate separation (MNS) on heart rate variability (HRV), a measure of involuntary nervous system activity in response to stress. The authors measured HRV in 16 2-day-old full-term neonates sleeping in skin-to-skin contact (SSC) with their mothers and sleeping alone, for 1 hour in each place, before discharge from hospital at the University of Cape Town, South Africa. They recorded cardiac interbeat intervals and continuous electrocardiogram using two independent devices. In addition, they continuously observed and recorded infant behaviour using a validated scale. The results showed a 176% increase in involuntary nervous system activity and an 86% decrease in quiet sleep duration during MNS compared with SSC. MNS in mammals is a model for studying the effects of stress on the development and function of physiological systems. In contrast, for humans, MNS is a Western norm and often a standard medical practice, the physiological impact of which is unknown. This study shows that MNS is associated with a dramatic increase in HRV, possibly indicative of anxious involuntary arousal. MNS had also a profoundly negative impact on quiet sleep duration. MNS may be a stressor the human neonate is not well-evolved to cope with, and may not be benign.

Tollenaar MS, Beijers R, Jansen J, Riksen-Walraven JMA, de Weerth C. Solitary sleeping in young infants is associated with heightened cortisol reactivity to a bathing session but not to a vaccination. *Psycho-neuroendocrinology* 2012;37: 167-77

The authors of this research followed 163 mother-infant pairs in the Netherlands to assess if different sleeping

arrangements modified the level of stress in infants less than 2 months-old in two different stressful situations: bathing at the age of 5 weeks, and vaccination at the age of 8 weeks. Stress levels were measured by the level of cortisol in the infants' saliva: the more cortisol, the higher the stress. Measurements were made three times in each case, before, 25 minutes after and 40 minutes after bathing and vaccination. The three sleeping modes considered were: co-sleeping (more than 90% of the time, either bed-sharing and/or room-sharing with parents); solitary sleeping (more than 90% of the time); and partial co-sleeping (11-90% of the time). Important confounders were taken into account: quality of maternal care-giving behaviour; breastfeeding; number of infant night awakenings and total sleep duration. A number of other child and maternal variables were also considered, such as gender, birth weight, maternal age, smoking, etc. Mothers were requested to fill a diary explaining sleeping habits, feeding activities, etc., and the two stressful situations were videotaped. Concerning the bathing session, the solitary sleep group showed a higher cortisol reaction than the other two groups, including 40 minutes after the bath; breastfeeding did not have a significant impact over time. In the vaccination situation, in comparison to the solitary sleepers, all co-sleepers demonstrated higher levels of cortisol before and well after the situation had ended; in comparison to bottle-fed infants, breastfed infants, however, showed higher levels of cortisol before vaccination, but lower levels 40 minutes after. Other indirect results included: co-sleepers were breastfed more often than solitary sleepers and though they woke more often, the total nightly amount of sleep equalled that of the other infants. Also, authors reflected that, in order to lower infants' stress levels, it may suffice that they sleep in proximity with their parents, rather than with them.

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