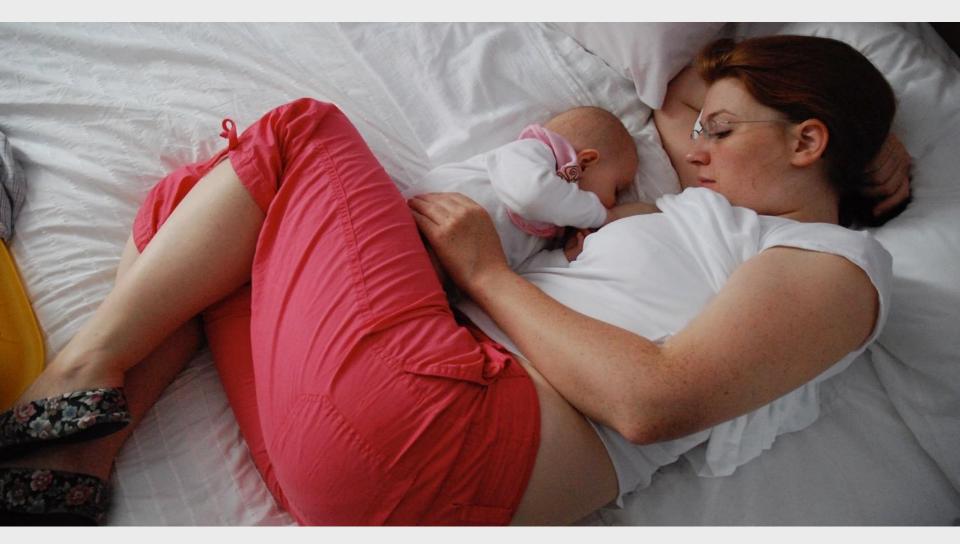


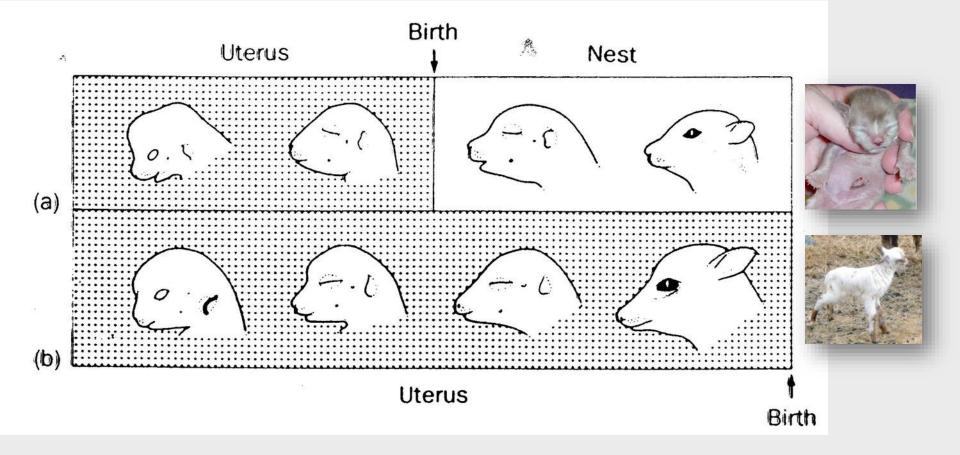
Infant Feeding & Sleeping

Prof. Helen Ball, Infancy & Sleep Centre, Anthropology, Durham University <u>www.dur.ac.uk/disc</u> <u>www.BasisOnline.org.uk</u>

Humans have mammal babies!



Mammal babies: altricial and precocial



Cache and Carry

 Mammals with altricial infants use a cache strategy: multiple infants in a litter, develop in nest (safety & warmth), mother leaves infants to forage, feed infrequently (e.g. once or twice per day), high fat content milk

 Mammals with precocial infants use a carry/follow strategy: one infant at a time, able to walk/cling shortly after birth, remains with mother (safety & warmth) while she forages, feed frequently and on demand (e.g. hourly), low fat/high sugar content milk





Where do human new-borns fit?



- Humans produce single infants, born with well developed internal and sensory organs (see, hear, call) = precocial
- Lactation characteristics of precocial mammals: milk = low fat/high sugar, infants need to feed frequently
- Poorly developed neuro-muscular control = unable to follow or even cling because typical brain growth cannot be completed prior to birth
- Humans have 25% adult brain at birth compared with 50% for other primates etc. they are therefore unusually neurologically undeveloped

Extero-gestation (or 4th trimester)



- Human neonates complete their gestation outside of the womb
- During this period they need close contact for warmth and security, and for biological regulation
- Newborn babies have difficulty stabilizing their temperature and breathing independently
- Babies do not develop their own circadian rhythms and cannot sustain long periods of uninterrupted sleep for several months
- Sleeping in close proximity to a carer is what 'sleeping like a baby' really means!

How do babies sleep?



Babies sleep very differently from their parents:

- they need much more sleep (but variable)
- they don't sleep exclusively at night no day/night cycle
- they don't sleep continuously wake every 2-3 hours or less
- they fall asleep differently into 'active' sleep first = light
- have shorter sleep cycles 60 vs. 90 mins
- experience much more active (REM) sleep

Normal 24-hour sleep duration for babies

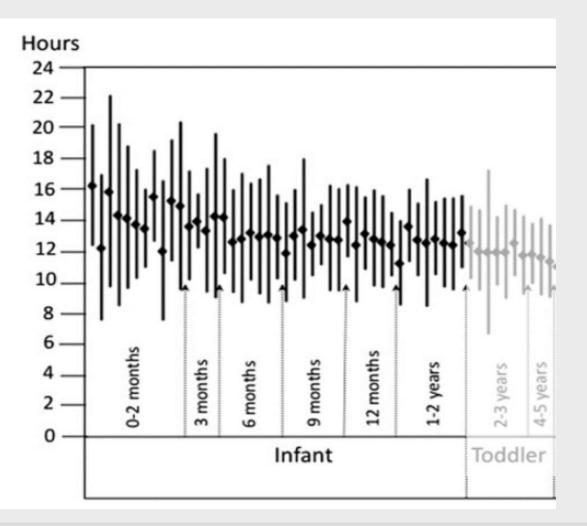
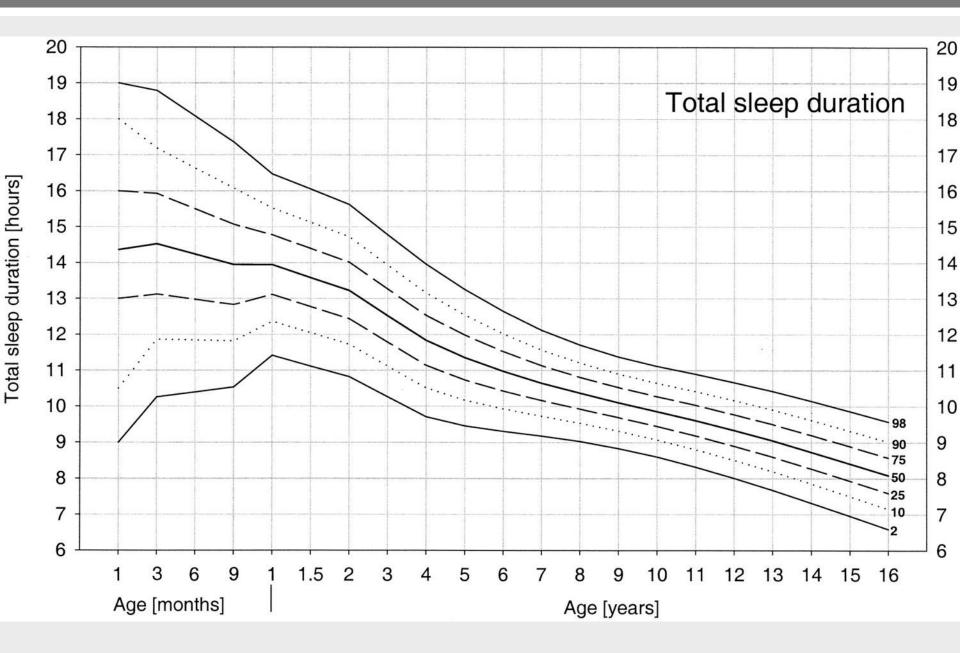


Figure from Galland et al., Normal sleep patterns in infants and children: A systematic review of observational studies. Sleep Medicine Reviews 2012;16:213-222



Sleeping like a baby...



Moore & Ucko (1957)

- Studied 160 babies to define 'normal' infant sleep.
- Babies were 'Sleeping through the night' if parents reported no crying/fussing 12 to 5am
- 70% began to sleep through at 3 months of age, half reverted back to night waking
- Majority not fed human milk, slept prone, in a separate room very different from today!

Breastfed and formula-fed infant sleep

- Most pediatric and popular knowledge about babies' sleep maturation and regulation is based upon studies of formula-fed infants sleeping alone
- Parents now consider infant night waking to be problematic but for breastfed infants it is normal and expectable. Babies digest breast-milk in 90 minutes, and therefore feel hungry again in 2-3 hours.
- Many parents hear that supplementing the baby's diet with formula, or formula plus a thickener will encourage early settling.
- 'Settling' = the phase when a baby begins to fall quickly into deep sleep and stay asleep for prolonged period (12am to 5am).
- Encouraging early settling = desirable parenting goal for past 50-60 years coincident with increased prevalence of formula use.

Durham (UK) Sleeping Like a Baby Study



Focus group study investigate maternal perceptions of links between infant sleep and feeding (Rudzik & Ball, 2016)

Semi-structured discussion with seven focus groups conducted with adolescent and adult mothers of mixed ethnicities with infants under 1 year – breast and formula feeding participants (6-9 per group).

Mothers' views

Dominant view

"With breastfeeding you don't know how much they're actually having... if they're hungry they could wake up like 2 hours later or something." "Formula and sleep is the key. Breastfeeding and sleep is not happening"

Alternate view

"I think it's quite an old fashioned notion that they need formula to sleep better ...my mother-in-law and my auntie who are of that older generation, they're like 'He's not sleeping through, you need a bottle. You need to give him formula.' Formula and solids. I was told that at 3 months! [laughs] I was like 'No, I don't think he does'"

Divergent Understandings

"I've always had all of them in a routine. I believe that a baby fits round your routine, you don't fit around theirs."

"[Babies] sleep when they need it, and forget it. You've got to work round them. And that's all there is to it...As often as she wakes is when she wakes."



Divergent Strategies



"I was getting no sleep whatsoever so after 6 weeks...I asked me mum what she done with us...and she says like do the tough love thing so I tried it and I just stuck it out and after 2 weeks she just slept all night."

Divergent Strategies



"If he's having a night where he wants to nurse a lot I'll put him in bed with me and I'll just sleep and he just latches on when he wants to and it doesn't really interrupt my sleep a great deal."

Outcomes

- Popular wisdom in the UK tightly links breastfeeding and inadequate night-time sleep.
- Mothers are frequently advised by peers and family to introduce formula or solid foods to promote longer sleep.
- The nature of infant sleep was understood differently by each group, as was its relationship to feeding method.
- Breastfeeding mothers viewed the fragmentary nature of infant sleep as natural, while mothers who were formula feeding felt that it was a problem to be fixed.
- The strategies and approaches used to promote infant and maternal sleep in each group were aligned with this underlying perception of how infant sleep works.

AEF Rudzik, HL Ball: Exploring Maternal Perceptions of Infant Sleep and Feeding Method Among Mothers in the United Kingdom. Maternal and Child Health Journal 2016; 20(1). DOI:10.1007/s10995-015-1798-7

Feeding type and infant sleep

- Tikotsky et al (2010) while examining relationship between infant sleep and growth, reported on infant sleep and breastfeeding for 96 6-month old infants.
- Sleep was measured actigraphically over 4 nights.
- Breastfeeding was correlated with more fragmented sleep, but not less sleep.
- No data were reported for sleep location.



Feed type & infant sleep

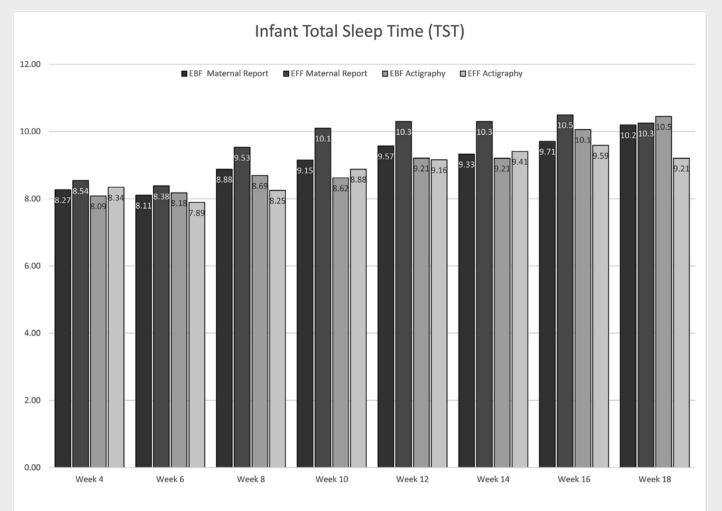


- Huang et al (2008) Investigated influence of difference patterns of feeding on sleep status of 3016 infants aged 0-6 months.
- Breastfed infants had greater night-time sleep (9.05h), more sleep frequency and higher rates of bed-sharing.

Huang et al (2008) A study on influence of different patterns of feeding on sleep of infants Chinese Journal of Woman and Child Health Research

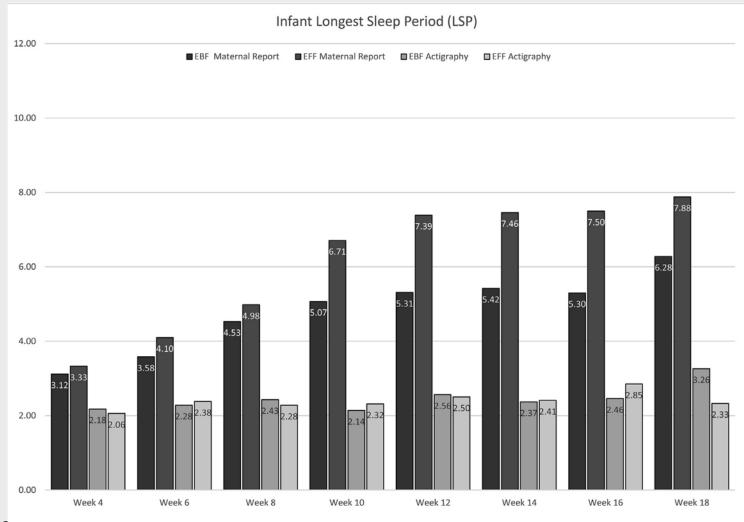
Feed type & infant sleep

Durham 'Sleeping like a baby' Study (50 mother-baby pairs) who were either exclusively breast or formula feeding for first 18 weeks of life found no differences in objective measures of total sleep time (Rudzik et al 2018).



Feed type & infant sleep

But found BIG differences in perception of longest sleep period.



Does feed type affect mothers' sleep?

- Doan (2007) found that mothers who exclusively breastfed at night obtained ~40m more sleep per night than mothers who gave infants formula
- Building on the above Montgomery-Downs et al (2010) examined the impact of breastfeeding on maternal sleep
- Found differences in subjective reports, but not in objective measures of sleep duration, or scores on 3 different sleepiness scales



Feeding type and maternal sleep

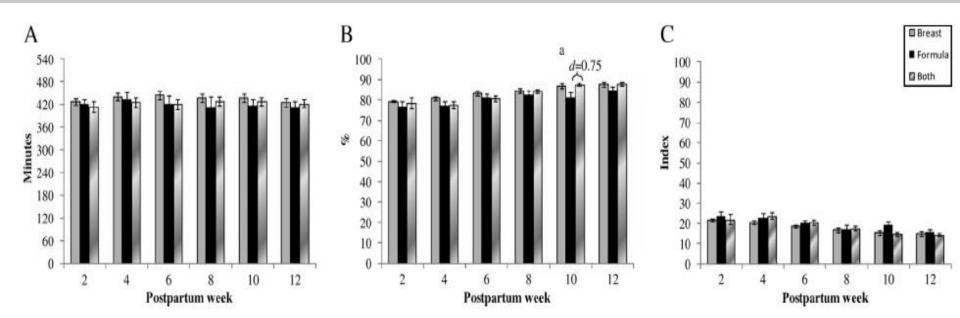


FIGURE 1

Objective measures of total sleep time (A), sleep efficiency (B), and sleep fragmentation (C) among mothers who fed their infants breast milk, formula, both at each postpartum week. ^aP < .01.

Montgomery-Downs et al (2010) Infant Feeding Methods, Maternal Sleep and Daytime Functioning Pediatrics 2010; 126;

Feeding and sleeping overview



- Common belief suggests that because breastfed babies wake frequently to feed, mums do too, and so both get less sleep
- However studies show that as they get the same or more sleep than formula feeding dyads, they return to sleep more quickly, or sleep during feeds – but the sleep fragmentation caused by breastfeeding may be experienced as 'poorer quality sleep'.

North Tees Infant Sleep Study

- 1998-2000 253 families with newborn infants born at N. Tees
- Sleep diaries for 7 consecutive days during 1st and 3rd month
- Semi-structured interviews at end of 1st and 3rd month
- Half of all babies (49%) bed-shared sometime during 1st 3 months



Ball, HL (2002) "Reasons to share: why parents sleep with their infants". Journal of Reproductive and Infant Psychology, 20 (4): 207-221.

Breastfeeding and bed-sharing

	North Tees Study	CESDI Study
Bed-shared in 1st month	47.4%	47.9%
Bed-shared in 3rd month	29.4%	24.2%

- Breastfeeding and bed-sharing are very clearly intertwined:
 - 72% of infants who breastfed for 1 month or more were bed-sharers
 - 38% of formula-fed babies bed-shared

Blair PS & HL Ball (2004) "The prevalence & characteristics associated with parent-infant bed-sharing in England" Archives of Disease in Childhood. 89:1106-1110

Why do parents sleep with their baby?

Most new parents don't anticipate bed-sharing – but one month after having their child a large proportion do. Parents who regularly bed-share give several reasons:

- 1. Night-time breastfeeding & regular sleep disruption easier to cope with
- 2. Calms and settles babies, reduces crying, reduces sleep deprivation
- 3. Parents who work miss their baby during the day, provides bonding and 'feel good' time (fathers especially)
- 4. Reassurance of monitoring the baby when ill or always
- 5. Familial or cultural beliefs make it part of parental identity & nurturing
- 6. Circumstances (poverty, lack of space) no options / accidental no plan

Ball et al. (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, et al. (2000). Parent-Infant Cosleeping: fathers' roles and perspectives. *Infant and Child Development* 9(2): 67-74. Ball, HL (2002) "Reasons to share: why parents sleep with their infants". *Journal of Reproductive and Infant Psychology*, 20 (4): 207-221.

Salm-Ward (2014) Systematic synthesis

- Systematic narrative synthesis to review a) reasons parents bed-share b) cultural context of bed-sharing c) implications for interventions
- Study inclusion: bed-sharing under 12 months, reasons for bed=sharing, published 1990-2013. 34 studies included.
- Themes extracted = 1) breastfeeding, 2) comforting, 3) better/more sleep, 4) monitoring, 5) bonding/attachment, 6) environmental, 7) crying, 8) tradition, 9) disagree with danger, 10) maternal instinct.
- Breastfeeding was the most commonly cited reason for bed-sharing (26 studies); bed-sharing was cited as an easy and convenient way to manage frequent night-time feedings; mothers reported not having to 'fully waken' to breastfeed and that preservation of maternal sleep was especially important at return to work.

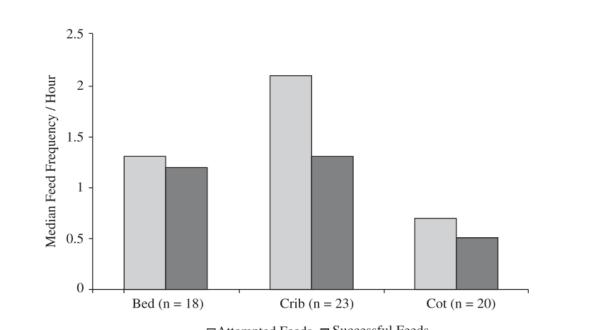
Salm-Ward, T. (2014) Reasons for mother-infant bed-sharing. *Maternal and Child Health J.* DOI 10.1007/s10995-014-1557-1.

Sleep contact on postnatal ward



Ball, HL; Ward-Platt, MP et al (2006) Randomised trial of mother-infant sleep proximity on the post-natal ward: implications for breastfeeding initiation and infant safety Archives of Disease in Childhood 91: 1005-1010.

Breastfeeding initiation



 \square Attempted Feeds \blacksquare Successful Feeds

FIGURE 12-1 Median frequency per hour of attempted and successful breastfeeds for mothers and infants by randomly allocated sleep condition. For attempted feeds the difference between bed and cot and crib and cot were significant (p = 0.012; p = 0.008). For successful feeds the differences between bed and cot and crib and cot were also significant (p = 0.003; p = 0.013). There were no significant differences between the bed and crib conditions. All comparisons tested using Mann–Whitney U test.

Ball HL, Ward-Platt MP et al (2006) 'Randomised trial of mother-infant sleep proximity on the post-natal ward: implications for breastfeeding initiation and infant safety'. Archives of Disease in Childhood 91:1005.

Breastfeeding initiatiion

- Mothers and babies randomised to bed and side-car crib conditions breastfed more frequently than those randomised to normal rooming-in.
- No differences were found in duration of maternal or infant sleep, frequency or duration of staff visits, number or duration of hazardous events (0 in both cases).
- Facilitating frequent feeding in the early post-partum period leads to increased prolactin production, which influences the timing and intensity of lactogenesis II (copious milk production).
- Women whose milk comes in early and copiously express greater confidence in their ability to breastfeed and their babies are less likely to receive early supplementation.
- Rooming-in is better than nursery care, but for breastfeeding initiation following vaginal delivery, even closer is better.

Ball, H.L. (2008). Evolutionary Paediatrics: a case study in applying Darwinian Medicine. In Medicine and Evolution: Current Applications, Future Prospects. Elton, S. & O'Higgins, P. New York: Taylor & Francis. 127-152.

Bed-sharing supports breastfeeding



HL. Ball, D Howel, A Bryant, E Best, CK Russell, M Ward-Platt: Bed-sharing by breastfeeding mothers: who bed-shares and what is the relationship with breastfeeding duration? Acta Paediatrica 2016 DOI:10.1111/apa.13354

How do breastfeeding mothers bed-share?



Ball, HL. Parent-infant bed-sharing behaviour. Human Nature 2006; 17(3): 301-316

Night-time proximity and responsivity is important

- Strong association between breastfeeding and infant sleep location
- The majority of mothers who breastfeed bed-share
- Facilitates night-time feeding, and helps maintain milk supply
- Many breastfeeding organisations highly value mother-infant sleep contact
- Help mothers to think about strategies that support both their own and their baby's need and minimise night-time disruption

Ball, HL (2008) Evolutionary Paediatrics: a case study in applying Darwinian Medicine. In Medicine and Evolution: Current Applications, Future Prospects. Elton, Sarah & O'Higgins, Paul New York: Taylor & Francis.

Duration of breastfeeding & SIDS-risk

- Individual data from 8 case control studies (2267 SIDS and 6837 controls) were analysed to determine relationship between SIDS and breastfeeding.
- Breastfeeding for more than 2 months was protective (50%), with greater protection seen with increased duration of both exclusive and any breastfeeding.
- Breastfeeding for less than 2 months was not associated with reduced SIDS

Duration of Breastfeeding and Risk of SIDS: An Individual Participant Data Meta-analysis

John M.D. Thompson, PhD,* Kawai Tanabe, MPH,^b Rachel Y. Moon, MD,* Edwin A. Mitchell, FRSNZ, FRACP, FRCPCH, DSc (Med),* Cliona McGarvey, PhD,^d David Tappin, MBBS, MD, MSc,^e Peter S. Blair, PhD,^f Fern R. Hauck, MD, MS^b

CONTEXT: Sudden infant death syndrome (SIDS) is a leading cause of postneonatal infant mortality. Our previous meta-analyses showed that any breastfeeding is protective against SIDS with exclusive breastfeeding conferring a stronger effect. The duration of breastfeeding required to confer a protective effect is unknown.

OBJECTIVE: To assess the associations between breastfeeding duration and SIDS.

DATA SOURCES: Individual-level data from 8 case-control studies

STUDY SELECTION: Case-control SIDS studies with breastfeeding data DATA EXTRACTION: Breastfeeding variables, demographic factors, and other potential

confounders were identified. Individual-study and pooled analyses were performed.

RESULTS: A total of 2267 SIDS cases and 6837 control infants were included. In multivariable pooled analysis, breastfeeding for <2 months was not protective (adjusted odds ratio [aOR]: 0.91, 95% confidence interval [CI]: 0.68-1.22). Any breastfeeding ≥2 months was protective, with greater protection seen with increased duration (2-4 months: aOR: 0.60, 95% CI: 0.44-0.82; 4-6 months: aOR: 0.40, 95% CI: 0.26-0.63; and >6 months: aOR: 0.36, 95% CI: 0.22-0.61). Although exclusive breastfeeding for <2 months was not protective (aOR: 0.82, 95% CI: 0.59-1.14), longer periods were protective (2-4 months: aOR: 0.61, 95% CI: 0.42-0.87; 4-6 months: aOR: 0.46, 95% CI: 0.29-0.74).

LIMITATIONS: The variables collected in each study varied slightly, limiting our ability to include all studies in the analysis and control for all confounders.

CONCLUSIONS: Breastfeeding duration of at least 2 months was associated with half the risk of SIDS. Breastfeeding does not need to be exclusive to confer this protection

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Dr Thompson conceptualized and designed the study, conducted the analyses, and drafted the initial manuscript; Ms Tanabe and Drs Moon and Hauck conceptualized and designed the study, participated in the interpretation of the data, and critically reviewed and revised the manuscript; Drs Mitchell, McGarvey, Tappin, and Blair provided data for the study and reviewed and revised the manuscript; and all authors approved the final manuscript as submitted

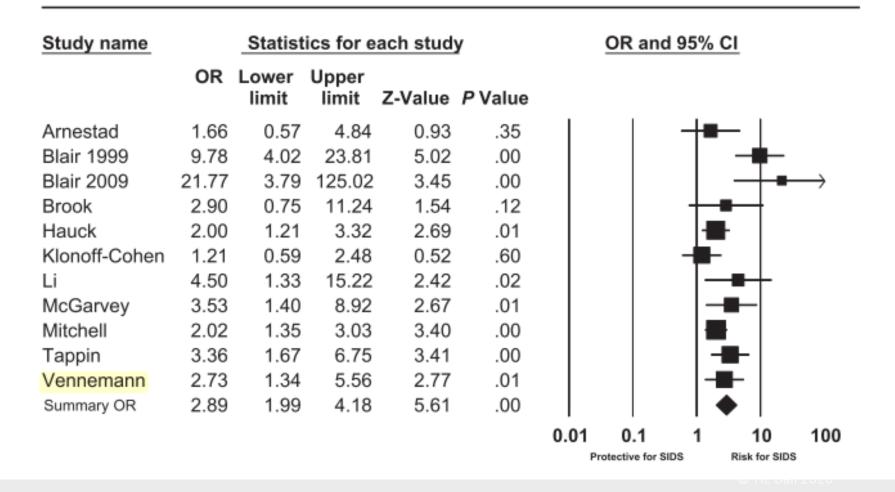
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SIDS case-control studies



Vennemann, M. M et al. (2012). Bed sharing and the risk of sudden infant death syndrome: can we resolve the debate? *Journal of Pediatrics*, 160(1), 44–8.e2. doi:10.1016/j.jpeds.2011.06.052

Bed-Sharing in the Absence of Hazardous Circumstances: Is There a Risk of Sudden Infant Death Syndrome? An Analysis from Two Case-Control Studies Conducted in the UK

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Abstract

Objective: The risk of sudden infant death syndrome (SIDS) among infants who co-sleep in the absence of hazardous circumstances is unclear and needs to be quantified.

Design: Combined individual-analysis of two population-based case-control studies of SIDS infants and controls comparable for age and time of last sleep.

Setting: Parents of 400 SIDS infants and 1386 controls provided information from five English health regions between 1993–6 (population: 17.7 million) and one of these regions between 2003–6 (population: 4.9 million).

Results: Over a third of SIDS infants (36%) were found co-sleeping with an adult at the time of death compared to 15% of control infants after the reference sleep (multivariate OR = 3.9 [95% Cl: 2.7–5.6]). The multivariable risk associated with co-sleeping on a sofa (OR = 18.3 [95% Cl: 7.1–47.4]) or next to a parent who drank more than two units of alcohol (OR = 18.3 [95% Cl: 7.7–43.5]) was very high and significant for infants of all ages. The risk associated with co-sleeping next to someone who smoked was significant for infants under 3 months old (OR = 8.9 [95% Cl: 5.3–15.1]) but not for older infants (OR = 1.4 [95% Cl: 0.7–2.8]). The multivariable risk associated with bed-sharing in the absence of these hazards was not significant overall (OR = 1.1 [95% Cl: 0.6–2.0]), for infants less than 3 months old (OR = 1.6 [95% Cl: 0.96–2.7]), and was in the direction of protection for older infants (OR = 0.1 [95% Cl: 0.01–0.5]). Dummy use was associated with a lower risk of SIDS only among co-sleepers and prone sleeping was a higher risk only among infants sleeping alone.

Conclusion: These findings support a public health strategy that underlines specific hazardous co-sleeping environments parents should avoid. Sofa-sharing is not a safe alternative to bed-sharing and bed-sharing should be avoided if parents consume alcohol, smoke or take drugs or if the infant is pre-term.

Citation: Blair PS, Sidebotham P, Pease A, Fleming PJ (2014) Bed-Sharing in the Absence of Hazardous Circumstances: Is There a Risk of Sudden Infant Death Syndrome? An Analysis from Two Case-Control Studies Conducted in the UK. PLoS ONE 9(9): e107799. doi:10.1371/journal.pone.0107799

National Institute for Health and Care Excellence

Postnatal care

Final

[M] Benefits and harms of bed sharing

NICE guideline NG194

Evidence review underpinning recommendations 1.3.13 to 1.3.14 April 2021

> Final These evidence reviews were developed by the National Guideline Alliance, part of the Royal College of Obstetricians and Gynaecologists

National Institute for Health and Care Excellence

Final

Postnatal care

[N] Co-sleeping risk factors

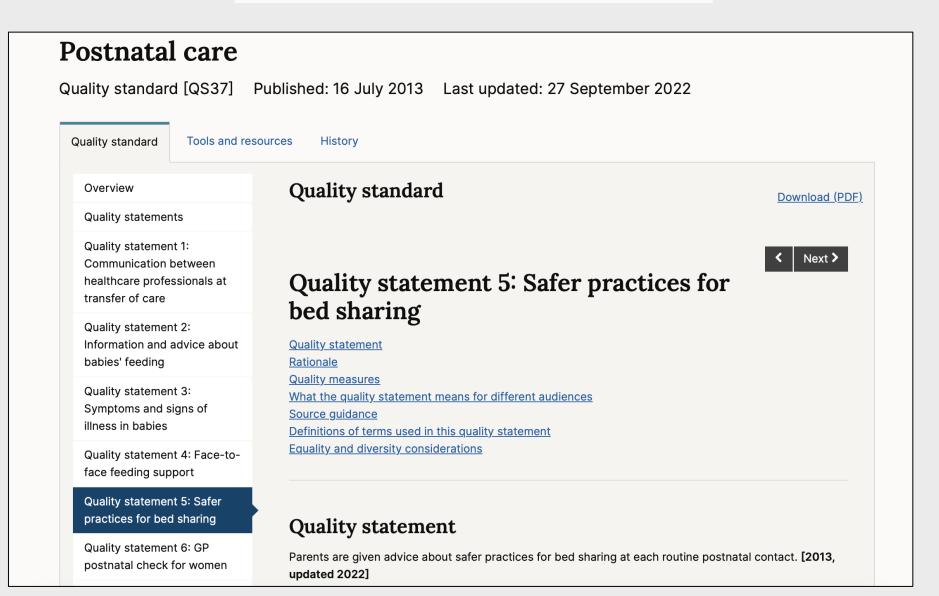
NICE guideline NG194

Evidence review underpinning recommendations 1.3.13 to 1.3.14 April 2021

Final

These evidence reviews were developed by the National Guideline Alliance, part of the Royal College of Obstetricians and Gynaecologists

NICE National Institute for Health and Care Excellence



CO-SLEEPING* AND SIDS: A guide for health professionals

~700,000

babies are born each year in England and Wales¹

~350,000

babies will have slept together in an adult bed with one or both parents by three months, whether intended or not² Sleeping in close contact helps babies to settle and supports breastfeeding,^{3,4,5} which in turn protects babies from Sudden Infant Death Syndrome (SIDS).⁶

On any night, 22% of babies will bedshare⁶ - so 154,000 babies will be in bed with their parent tonight.²

IN 2016, 219 BABIES DIED OF SIDS IN THE UK: 0.03% OF ALL BIRTHS⁷

Previous UK data suggests:

- around half of SIDS babies die while sleeping in a cot or Moses basket.
- around half of SIDS babies die while co-sleeping. However, 90% of these babies died in hazardous situations which are largely preventable.^{#,8}



IF NO BABY CO-SLEPT IN HAZARDOUS SITUATIONS, WE COULD POTENTIALLY REDUCE CO-SLEEPING SIDS DEATHS BY NEARLY 90%⁸

unicet

UNITED KINGDOM

unicef.uk/safesleeping

Baby sleep info source

*Co-sleeping: an adult and a baby sleeping together on any surface (such as a bed, chair or sofa). § Bed-sharing: sharing a bed with one or both parents while baby and parent(s) are asleep. # Using SIDS by sleeping environment from the latest case-control study conducted in England.

llaby

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THE BABY

FRIENDLY

INITIATIVE





To reduce the chance of sudden infant death syndrome (SIDS), always follow safer sleep **for** your baby:

Put them on their BACK for every sleep

In a CLEAR FLAT SLEEP SPACE

Keep them SMOKE FREE day and night







Tips for safer bedsharing

Some parents choose to share a bed with their baby.

Be aware – You should not share a bed with your baby if:

- you have recently drunk any alcohol
- you or your partner smoke
- you have taken any drugs that make you feel sleepy or less aware
- your baby was born prematurely or very small

Sofas and armchairs are always dangerous places to fall asleep with your baby – move somewhere safer if you might fall asleep



Summary

- Human infants are born with a particular set of needs that do not fit easily with contemporary adult life.
- Huge advances have been made in understanding the relationship between breastfeeding & sleeping, and consequences such as mothers' ability to cope with night-time care.
- Mothers use bed-sharing as a coping strategy for night nursing and sleep disturbance – associated with greater breastfeeding duration.
- In the UK the approach to SIDS / infant sleep safety has moved from an instructional to an educational model
- Parents with babies at 'high risk' for SIDS due to prenatal smoke exposure, premature birth etc. need explanation of their babies' safe sleep needs.
- All parents have a need for targeted information on safe bed-sharing.
 Emphasise planning ahead.
- Educate all parents on the possibility of falling asleep with their baby and hazards of accidental /unplanned co-sleeping.



▼ Resources

Co-sleeping image bank

News

The baby sleep info source

For parents who wish to make informed choices about infant sleep and night-time care.

www.BasisOnline.org.uk



Welcome to Baby Sleep info

This website presents research evidence about biologically normal sleep for human babies.

We discuss how infant sleep may vary due to cultural behaviours and expectations such as what babies are fed, where they sleep, and how we interpret their needs. This information is for;

a) parents who wish to make informed choices about infant sleep and night-time care b) health professionals who wish to share evidence-based information with parents about infant sleep.

ISIS does not address clinical sleep problems or provide individual sleep advice and parents should contact a health professional with any concerns about their baby's health. For information about the organisations and funding that support ISIS please see 'About Us'.

