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REVIEW

Why babies should never sleep alone: A review of the co-sleeping controversy in relation to SIDS, bedsharing and breast feeding

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KEYWORDS
co-sleeping;
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SIDS;
breast feeding;
mother–infant relationship

Summary There has been much controversy over whether infants should co-sleep or bedshare with an adult caregiver and over whether such practises increase the risk of SIDS or fatal accident. However, despite opposition from medical authorities or the police, many western parents are increasingly adopting night-time infant caregiving patterns that include some co-sleeping, especially by those mothers who choose to breast feed. This review will show that the relationships between infant sleep patterns, infant sleeping arrangements and development both in the short and long term, whether having positive or negative outcomes, is anything but simple and the traditional habit of labelling one sleeping arrangement as being superior to another without an awareness of family, social and ethnic context is not only wrong but possibly harmful. We will show that there are many good reasons to insist that the definitions of different types of co-sleeping and bedsharing be recognised and distinguished. We will examine the conceptual issues related to the biological functions of mother–infant co-sleeping, bedsharing and what relationship each has to SIDS. At very least, we hope that the studies and data described in this paper, which show that co-sleeping at least in the form of roomsharing especially with an actively breast feeding mother saves lives, is a powerful reason why the simplistic, scientifically inaccurate and misleading statement 'never sleep with your baby' needs to be rescinded, wherever and whenever it is published.
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'Don't sleep with your baby or put the baby down to sleep in an adult bed. . .The only safe place for babies to sleep is a crib that meets current safety standards and has a tight-fitting-mattress.'

Ann Brown, Commissioner, Consumer Product Safety Commission, United States of America, September 29, 1999

'Our data do not support this recommendation. Almost all SIDS deaths associated with parental bedsharing occurred in conjunction with a history of parental drug use and occurred in association with the prone sleep position or sleep surfaces such as a couch or waterbed.' *Gessner et al.*[1]

INTRODUCTION

While recent cultural implements such as cribs, mattresses and bedding did not evolve to protect and feed infants throughout the night, protective maternal behaviours including bodily contact between the mother and infant during co-sleeping most certainly did.[2,3] Despite opposition

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from western medical authorities or police officials, many western parents are increasingly adopting night-time infant caregiving patterns that include some co-sleeping behaviour, especially amongst mothers who breast feed.[4,5]

One recent survey in the United States found that during the 1990s the numbers of mothers sharing their bed with their infants for part or all of the night doubled and may have reached as many as 50%.[6] That same survey involving over 10 000 families revealed that breast feeding mothers were three times more likely than bottle feeding mothers to bedshare.[5,7] Similar findings have been documented in Great Britain,[8] Australia[9] and New Zealand.[10]

It appears that the biology underlying breast feeding behaviour—the new western feeding norm—acts as a 'hidden regulator' increasing night-time mother–infant proximity whether sleeping in the same bed or within arms reach on a different surface.[11] Thus, when human infant sleeping arrangements are viewed from this evolutionary lens we should not be entirely surprised. After all, mother–infant co-sleeping represents the most biologically appropriate sleeping arrangement for humans and is both ancient and ubiquitous simply because breast feeding is not possible, nor as easily managed, without it.[12] The increased sensory contact and proximity between the mother and infant induces potentially beneficial behavioural and physiological changes in the infants.[13–15] Such changes, observed by mothers, probably explain why within days of arriving home after giving birth mothers adopt one of two forms of co-sleeping, roomsharing or bedsharing, for part or all of the night. Mothers report less infant crying, more maternal and infant sleep and increased milk supply due to the increased frequency of night-time breast feeding that close contact facilitates.[4,5,9,13,14,16–18]

Polysomnographic studies comparing exclusively breast feeding, bedsharing and solitary sleeping mothers show that even in the deepest stages of sleep, mothers aroused 30% more frequently when they bedshared. That a high fraction (~1/2) of maternal arousals overlaps the infant's arousals and about two-thirds of those times, the infant clearly aroused first suggests a relatively high responsivity on the part of the mother. This heightened sensitivity might increase the chances that mothers could more quickly detect and intervene against a life threatening event that night-time separation from the baby precludes.[19,20]

Three major epidemiological studies have shown that when a committed caregiver, usually the mother, sleeps in the same room but not in the same bed with their infant the chance of the infant dying from sudden infant death syndrome (SIDS) is reduced by 50%.[21–23] This protective factor does not generalise to co-sleeping in proximity to siblings.[22] That a specific adult caregiver appears necessary for protection lends support to the hypothesis that it is in the nature of the mutual sensory vigilance i.e. the social and biological connection between an infant and its caregiver that is critical if co-sleeping is to be protective (or dangerous) as argued elsewhere.[15] In other words, caregiver intention and motivation matters!

Most USA and other western infants die from SIDS or from fatal accidents during solitary sleep outside the supervision of a committed adult.[24] Moreover, the overwhelming number of suspected accidental overlays or fatal accidents occur not within breast feeding–bedsharing communities but in urban poverty, where multiple independent SIDS risk 'factors' converge and bottle feeding rather than breast feeding predominates. Additional adverse risk 'factors' associated with bedsharing in high-risk populations are maternal smoking, infants placed to sleep on pillows or under duvets, with other children and co-sleeping with infants on sofas, waterbeds or couches. Bedsharing when the infant sleeps with an adult other than the mother, maternal exhaustion, alcohol or drug use, or leaving infants unattended on an adult bed also increase SIDS risks and/or fatal accidents.[21,25–28]

This review examines conceptual issues related to the biological functions of mother–infant co-sleeping, bedsharing and what relationship each has to SIDS. It addresses the lack of definition as to what constitutes co-sleeping in studies that argue against the practice[29] and describes reasons why in western industrialised countries the question concerning what constitutes safe infant sleep has been turned on it's head. That is, solitary infant sleep in 'baby designed cots,' devoid of parental contact–a novel and biologically unexpected sleep environment for the human infant–is regarded without qualifications by some researchers as being inherently safer than any and all forms of mother–infant co-sleeping.[30] Moreover, mothers' bodies, whether offering breast milk or not and independent of sobriety, continue to be regarded as potentially lethal weapons–wooden rolling pins, if you will, over which neither mothers nor their infants have control during sleep (see Consumer Product Safety Commission (CPSC) statement by Ann Brown, above).

The need to distinguish between safe and unsafe beds and bedsharing is essential in clarifying under what conditions forms of co-sleeping (including forms of bedsharing) can be considered 'hazardous.'

Regarding breast feeding–bedsharing mother–infant dyads, where all known risk factors are absent, hospital medical policies and procedures increasingly leave bedsharing families educationally stranded without safety information. In an attempt to show why this approach will fail and why it is dangerous and discriminatory, we review the short and long-term beneficial psychological effects of co-sleeping. The results from several bedsharing studies and a behavioural and physiological study by McKenna and colleagues of Latino mother-infant bedsharing, are presented to illustrate that while bedsharing can never be publicly recommended due to its complexity, blanket recommendations against bedsharing and eliminating safety information for bedsharing families cannot be justified either. Indeed, forms of safe co-sleeping reduce the risks of SIDS among some infants, in some cultural groups.[31]

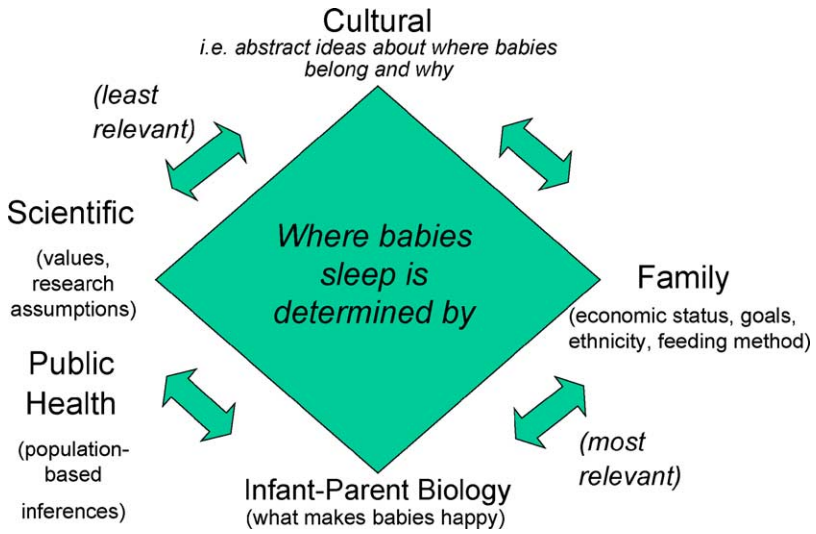

Figure 1 Most and least important factors influencing where any given infant, in any given family, on any given night, sleeps.

Finally, where an infant actually sleeps is not a medical issue at all but mostly it is social relational based on economics. Rarely do infants sleep in only one kind of micro-environment, which is why safety information for all sleeping arrangements should be provided. Only by considering the range of variables in relation to both the infant and the parent's unique biology will the question concerning why infants sleep where they do ever be fully understood and successful public health messages formulated (see Fig. 1).

HOW SOCIAL FOLK MYTHS ABOUT THE 'NORMALCY' OF SOLITARY INFANT SLEEP ACHIEVED SCIENTIFIC VALIDATION

When infant sleep studies were first undertaken using polysomnography the bottle fed, solitary sleeping infant became the gold standard method used to produce data on 'normal' infant sleep physiology. Neither ethological sleep studies of non-human primates nor cross-cultural or ethnographic data on more universal patterns were used as comparators. Instead, western social 'folk' assumptions about what constituted healthy infant sleep were made, often based on moral justifications reflecting recent cultural ideas about how and where babies *should* sleep (relative to parents) in order to protect the husband–wife relationship and to produce psychologically healthy 'independent' children.[3] It became accepted that an infant sleeping alone was a 'moral good'. Conceptions of what was in the best interest of infants medically found their way into moral characterisations of both the infants and the practices of parents who cared for them. That is, if it was 'good' for babies to sleep alone, it seemed a small step to concluding that 'good babies' did so! The 'good baby' descriptor is now practically synonymous with a baby's ability to 'sleep through the night' alone.

The ability to 'self-soothe' as early as possible was said by clinical workers to predict the infants' future capacity for self-reliance and good sleep hygiene as well as various adult competencies. Hence, the cultural history of infant sleep studies, including the mind set of researchers, helps explain why it is so difficult to insist, for example, that definitions of co-sleeping be standardised and confounding variables accounted for before varying outcomes associated with bedsharing can be compared and interpreted accurately. The presumption made by many SIDS epidemiologists and by the US Consumer Product Safety Commission[30] that 'co-sleeping' and especially, bedsharing, are inherently harmful apparently justifies their dismissing the idea that different forms of co-sleeping cannot legitimately be collapsed into a single category. By failing to distinguish between diverse forms of co-sleeping such as safe or unsafe including safe and unsafe bedsharing, a statistical illusion is created indicating that a singular risk factor exists across all co-sleeping circumstances, all mother–infant pairs and, especially, across all bedsharing sleep environments when, in fact, it does not.

The extent to which the science of paediatric sleep medicine and especially bedsharing research is held captive by personal ideologies (biases) and ethnocentrism especially with regard to the culturally perceived 'proper' nighttime relationship between parents and their children cannot be overstated. For at least 100 years western social and moral values and the new sleep 'science' served as the basis for defining how and where infants *should* sleep, rather than what should have served as a starting point, i.e. empirically-based anthropological research aimed first and foremost at elucidating both human infant and maternal biological needs, in relation to the evolved micro-environments that traditionally met those needs.

The popularity of scheduled bottle feeding in the 1950s only reinforced the idea that uninterrupted solitary crib sleeping was 'normal'. In the late 1950s and early 1960s when electro-physiological technology became more widely

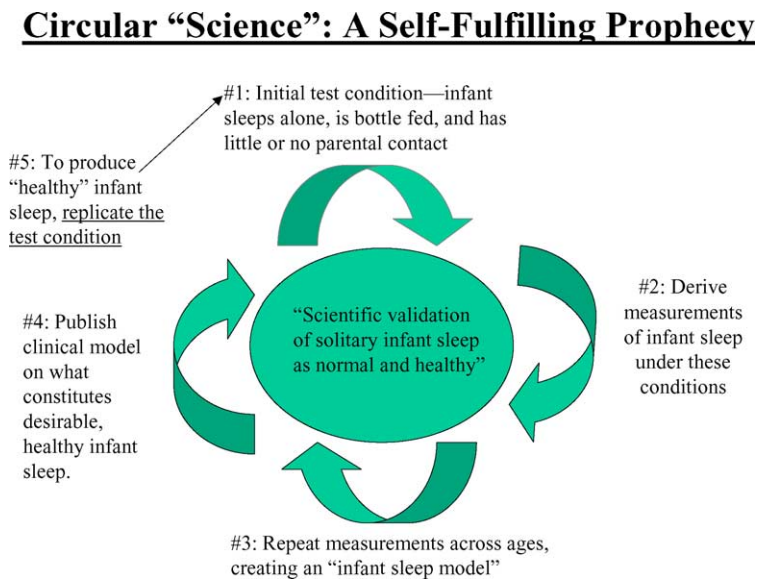

Figure 2 How social folk assumptions about the 'normalcy' and desirability of solitary infant sleep achieved scientific validation: five steps.

available, breast feeding was at an all time low in the USA, with fewer than 9% of mothers leaving hospitals breast feeding. Both cows milk and/or formula were encouraged by medical personnel and thought to be superior to human milk. Hence, pioneering sleep researchers had no reason to question the appropriateness of quantifying 'normal' infant sleep (sleep architecture) and arousal patterns under solitary sleeping conditions using bottle fed infants with little or no parental contact or night-time feedings.

Of course, this means that if contemporary parents, most of whom breast feed, want to produce 'normal and healthy' sleeping infants, only by re-creating the original environmental conditions under which 'healthy' infant sleep was measured (alone and bottle fed) could parents hope to succeed. Thus, clinically healthy infant sleep became synonymous with solitary sleep and vice-versa–i.e. culture and science appear inextricably bound (see Fig. 2). All the while warnings about the dire social and psychological consequences associated with any alternative forms of sleep and, especially, parent–infant co-sleeping continued unabated. Infant health could be obtained if mothers, in the words of Dr. Spock, 'followed the directions that *their* doctor(s) *gave them*.'

And should western mothers choose not to follow the orders that their doctors give them? We fear that they will not be made to feel any better after reading Richard Ferber's popular (unrevised) sleep training book sitting on the shelf at our local bookstore: 'If you find that you actually prefer to sleep with your infant' Dr. Ferber warns, '. . . you should consider your own feelings very carefully'.[32] Using a different evaluative system wherein maternal fitness is considered, one can imagine turning this statement around to read: 'If you actually prefer to place your infant in a different room to sleep, you should consider your own feelings very carefully.'

This chain of conditioned cultural expectations, values and historical processes explains how questions concerning what constitutes safe infant sleep environments have been turned on their head. The burden of proof concerning infant well being and safety continues to challenge defenders of mother–infant co-sleeping. Socially constructed folk assumptions, not deductive, empirically-based (species-wide) science, continue to answer the original question–how do infants sleep and, thus, how and under what conditions infant sleep must be measured and what recommendations are to be made.

The history of infant sleep studies in Western cultures illustrates how a 'belief' in the moral 'value' of uninterrupted solitary infant sleep remains, like religion, sacred, despite recent psychobiological and developmental studies that seriously challenge the validity of its assumptions. What seems to be important about infant sleep training, for example, is not that it has actually been demonstrated to succeed or even that ultimately it makes infants healthier or happier, in the majority of cases. What is important is that we 'believe' that it will work and it is worth trying, because of the values and purposes that underlie it.

Culture History and the SIDS–Bedsharing Debate: What's The Connection?

The commitments by professionals to this one-size-must-fit-all ideology regarding sleeping arrangements makes it easier for SIDS and paediatric sleep researchers to believe, a priori, that any violation of this artificially validated moral principle will inevitably or probably, lead to harm. This cultural history explains why discussions about where infants should sleep have never taken place on a level scientific playing field and why anti-bedsharing descriptive

reports are permitted to draw conclusions and make sweeping recommendations based on incomplete and anecdotal data. Based on objective evidence, these studies allegedly showing how dangerous it is for an infant to sleep next to its mother should not be difficult to challenge on scientific grounds, except that the ideologies associated with the appropriateness of infants sleeping alone are so deeply embedded within the methodological, analytical and interpretive choices made by researchers that both the science and the ideology become one and the same. Many paediatric clinicians think nothing, for example, of writing articles and books about solving problems (safety or otherwise) associated with solitary infant sleep but assume in contrast that parental sleep problems associated with co-sleeping are either not worth solving, should not be solved or cannot be solved, further illustrating the extent to which personal preferences and choices are easily confused for science in this area.

As regards how this affects the 'bedsharing debate,' consider that when critical data about infant bedsharing deaths are missing, health authorities act as if associated details pertaining to why the infants died are unnecessary. Instead, both researchers and health authorities (knowingly or not) fall back on at least 100 years of negative assumptions and anti-co-sleeping rhetoric strengthened by a general societal ignorance sustained by never having been exposed to any science or set of arguments that shows a different perspective.

IS COSLEEPING BIOLOGICALLY APPROPRIATE OR ANACHRONISTIC?

The Supine Co-sleeping Infant Probably Emerged to Facilitate Breast Feeding at Night

'For species such as primates, the mother *is* the environment' *Sarah Blaffer Hrdy… Mother Nature: A History of Mothers, Infants and Natural Selection (1999)*[33]

If anthropological evidence on infant sleep and development were integrated and used as a starting point to inform infant sleep research, there is no doubt that the question we would be asking is not if it is safe for an infant to sleep next to its breast feeding mother, but rather, is it safe not to!

Born with only 25% of its adult brain volume the human infant is neurologically the most immature infant primate of all, the slowest developing and the most reliant on its mother for the longest period of time for physiological regulation and support. Indeed, nothing that a human infant can or cannot do makes sense except in the light of the mother's body. Human infant milk composition, characterised by its low protein and fat content and high lactose, necessitates short intervals between breast feeds making human mother–infant co-sleeping not only expectable but biologically necessary. Moreover, mammal infants whose mothers leave them to sleep alone in nests neither cry nor defaecate until she returns (to lick them) so as not to attract predators. Human infants cry and defaecate spontaneously when their mothers leave indicating that the constant physical association between them is evolutionarily stable and appropriate.

With this in mind, consider that the single most important factor known to reduce the chances of an infant dying from SIDS reflects the function that the infant sleep position plays relative to its feeding connection to its mother. That is, the supine infant sleep position evolved in tandem with both breast feeding and mother–infant co-sleeping (an integrated adaptive system). It was only after breast feeding was replaced by bottle-feeding and solitary infant sleep environments replaced maternal–infant social sleep that recommendations to place infants prone for sleep made sense, or was even possible. But it was a tragic mistake that led to the deaths of thousands of Western babies from SIDS.

Several studies show that without instruction, the supine infant sleep position is universally chosen by the breast feeding–co-sleeping mother as it is extremely difficult for the breast feeding infant to move to initiate and receive a breast feed while sleeping next to its mother on its stomach, the most dangerous position for an infant to sleep.[34] Western parents paid a big price to learn that!

In England, however, while breast feeding was not examined in relation to each prone sleeping infant, there was no difference, whether bedsharing or not, regarding the prone position in controls but, still, six times the number of infants who died outside the parental bed were put down in the prone position and three times as many were found dead sleeping in this position. Unfortunately, the Confidential Enquiry into Stillbirths and Deaths in Infancy (CESDI) Great Britain study did not have information on whether mothers breast fed the infant immediately prior to death.[25]

The full explanation as to why the supine infant sleep position is protective (infants arouse more and sleep lighter) might only be achieved by acknowledging complexity, that the infant sleep position is only one of many interactive behavioural and physiological variables *each one of which changes in relation to the others when the breast feeding mother and infant sleep in close proximity*. These variables (see Tables 1 and 2) include increased infant and maternal interactions and arousals, face-to-face body orientations, more breast feeding, increased heart rate, increased infant body temperatures, increased movements and awakenings and less deep sleep,[35] all the while getting more total sleep.

From our infrared video studies of mother–infant bedsharing, supine infant sleep maximises the infant's overall ability to control its micro-environment.[11,34,36] Supine sleeping permits the infant to remove blankets covering its face, to move to and from the breast, to turn to face toward or away from its mother's face or body, to touch its own face and, without a great deal of effort, suck its fist or

Table 1 Effects of bedsharing on infant sleep.

	BN versus SN	*P* value
Total wakefulness during sleep	↓ 14%	0.008
Sleep stage %'s (of TST)		
% Stage 3–4	↓ 4%	<0.001
% Stage 1–2	↑ 3%	0.036
% Stage REM	–	–
Mean Stage Durations		
Stage 3–4	↓ 16%	0.027
Stage 1–2	↑ 16%	0.005
Stage REM	↑ 26%	0.001
Waking	–	–
Arousal frequency (/h)		
Stage 3–4		
EWs	↑ 38%	0.014
TAs	–*	–
Stage 1–2		
EWs	–	–
TAs	–	–
Stage REM		
EWs	↑ 35%	<0.001
TAs	–	–

Sources: Mosko *et al.*, 1996, 1997.[19,20,73].
BN: bedsharing night; SN: solitary night; TST: total sleep time; REM: rapid eye movement; EWs: epochal awakenings > 1 min; TAs: transient arousals (just a few seconds in duration).
Table shows the results of 2 × 2 repeated measures ANOVA (laboratory sleeping condition × routine sleeping condition). Entries show significant ($P < 0.05$) effects of laboratory condition (BN versus SN).
* For frequency of TAs in Stage 3–4, there was a significant effect of routine sleeping condition, reflecting 76% more frequent TAs in routinely bedsharing infants, irrespective of laboratory condition. The only other significant effects of routine sleeping condition or significant interaction effects were for % Stage 3–4 Sleep and Total wakefulness during sleep, and these reflected greater effects in routine bedsharers.

Table 2 Effects of bedsharing on maternal sleep.

	BN versus SN	*P* value
Total sleep time (TST)	–	–
Total wakefulness during sleep	–	–
Sleep stage %'s (of TST)		
% Stage 3–4	↓ 4%	0.001
% Stage 1–2	↑ 4%	0.014
% Stage REM	–	–
Mean stage durations		
Stage 3–4	↓ 25%	0.002
Stage 1–2	↓ 30%	<0.001
Stage REM	–	–
Waking	↓ 62%	<0.001
Arousal frequency (/hr)		
Stage 3–4		
EWs	↑ 67%	<0.001
TAs	–	–
Stage 1–2		
EWs	↑ 37%	<0.001
TAs	↑ 28%	<0.001
Stage REM		
EWs	–	–
TAs	–	–

Source: see Mosko *et al.*, 1997.[20]
BN: bedsharing night; SN: solitary night; TST: total sleep time; REM: rapid eye movement; EWs: epochal awakenings > 1 min; TAs: transient arousals (just a few seconds in duration).
Table shows the results of 2 × 2 repeated measures ANOVA (laboratory sleeping condition × routine sleeping condition). Entries show significant ($P < 0.05$) effects of laboratory condition (BN versus SN). The only other significant effects of routine sleeping condition or significant interaction effect was for the variable Frequency of TAs in Stage 1–2, and these showed enhanced TAs in routine bedsharers.

fingers.[13] Recent studies suggest that supine infant sleep in the breast feeding/bedsharing context maximises the chances that the baby will be able to respond to its mother's movements, sounds and touches. It further promotes easy and constant communication that reportedly serves as the basis of the growing mutual attachment between the mother and infant—a prerequisite for healthy infant development.[37]

Why Mother–Infant Co-sleeping Has *Not* Outlived Its Potential 'Usefulness' In Western Industrial Nations: Success of 'Kangaroo Care'

While infant sleeping arrangements vary enormously from culture to culture, the potentially beneficial physiological and psychological effects that night-time maternal contact asserts on the human infant do not. Only unique aspects of evolved, human infant biology and related human infant developmental needs that transcend cultural differences are sufficient to explain why responses to separation from the mother are so consistent across and within cultures. For example, in newborns up to one degree of temperature can be lost when infants are removed from their mothers' ventrums following birth, even when the separated infants are placed in incubators with ambient temperatures matching the mother's body temperature[38] and 11–16 week old, solitary sleeping infants have lower axillary skin temperatures compared with breast feeding infants sharing a bed with their mothers.[39]

Mechanical breathing teddy bears placed next to apnoea-prone human newborns, which replicate what the mother's body provides, have the effect of reducing infant apnoeas sometimes by as much as 40–60%, in addition to physically drawing infants to sleep next to them.[39] Many studies similarly show that infant mammals, including human infants, appear to be pre-sensitised to

receive sensory signals linking them to a co-sleeping partner.[40–43] All have been shown to change infant physiology, including heart rate and breathing patterns including the cessation of excessive night-time crying.[44] Until recently, all human infants experienced access to at least one co-sleeping adult body, usually the mother[45,46] so it is not surprising that maternal contact stimulates a variety of significant 'hidden regulatory processes' that are clinically advantageous to infants.

Authoritative child care experts favour early infant autonomy, by encouraging parents to 'train' infants to 'soothe themselves back to sleep' and by recommendations to eliminate night-time feeding and sustained parental reassurances.[47,48] Yet, recent studies show that increased co-sleeping behaviour, far from diminishing a child's ability to be alone or inhibit their abilities to innovate, appears to enhance such characteristics as shown by Keller and Goldberg who compared routinely co-sleeping toddlers with peers who never slept with their parents.[49]

Infant sleep training books rarely define what exactly they mean by infant' independence or autonomy, although it is clear that the concept more accurately implies parental independence (from the infant at night) rather than to any carefully measured psychological characteristic transferable to other situations by the infant. Still, infant 'independence' is assumed to be in evidence simply by the infant being conditioned to fall asleep, or put itself back to sleep, without eliciting parental contact or comfort.

Indeed, without evidence most sleep training advocates continue to assert that juvenile and adult self-assuredness and individualism is, at all points on the developmental continuum, equally beneficial and tied to being able to sleep alone at young ages. Yet, no research has ever demonstrated that social and psychological 'independence' cannot or is not mostly obtained through any number of different kinds of daily social infant experiences or social relationships. No studies have asked parents if the 'independence' claimed to be such a desirable trait for their 6 month old infant is equally as desirable when that same child turns 14.

The American Academy of Pediatrics' *Guide to Your Child's Sleep* moves from science to social opinion when they inform parents that infants should never be permitted to fall asleep at the breast or in the mother's arms following a breast feed[50] the very context within which the infant's falling asleep evolved and is practically impossible to prevent! Parents are taught that to establish lifelong 'healthy' sleep habits, their infants 'need' and 'should' be 'trained' to sleep alone.[32] Yet, according to the 2000 National Sleep Foundation Survey in the United States, 62% of American adults whose parents probably followed these general Dr Spock-inspired recommendations currently report difficulties falling and staying asleep, 60% of children under the age of 18 have complained to their parents about being tired during the day and 15% of children admit to falling asleep in school. These data suggest that there is either no simple correlation between early infant or childhood sleep patterns and adulthood, or that the solitary infant and childhood sleep training model aimed at creating 'healthy sleep habits', advocated for over 60 years appears not only to have failed miserably, but may have produced the opposite effects than were promised! In spite of these statistics childhood sleep guides continue to maintain that infants need to be taught to soothe themselves back to sleep with minimal or no parental involvement.[32,48,50]

Again, it is precisely this cultural context that helps to explain the simplistic recommendations against co-sleeping made by the Consumer Product Safety Commissioner in the USA. Yet, it would appear that strong biologically-based, emotional connections between breast feeding mothers and their infants, which predate recent cultural ideologies, might also explain why parents appear to be rejecting the recommendation always to place infants in cots to sleep, and never to 'sleep with' a baby.[51–53]

Why Sally Can't Sleep?

The mismatch between infant biological needs for night-time contact and feeding and societal goals to keep parents from their infants and children apart during the night probably explains why in non-industrialised societies western parents struggle and complain the most about how their infants and children fail to sleep.[54–57] Ancient underlying emotions controlled by the limbic system of the brain undoubtedly evolved to ameliorate, throughout our evolution, a life-threatening situation i.e. separation from the caregiver. The emotional responses by infants and children to resist parental isolation by crying and protesting are probably innate and adaptive, since separation from the caregiver most certainly meant rapid death for infants and children in the environments within which childhood sleep and emotions evolved. This evolutionary reality can be used to account for why 25–45% of otherwise healthy infants and children in western societies are said to suffer from 'sleep disturbances' or 'sleep problems'.[58] When parents *elect* to have their infants and children sleeping by their sides such sleep disturbances are greatly reduced, if reported at all.[59–61]

The Psychological Evidence That Healthy Social Relations in the Context of Co-sleeping Promotes Healthy Human Development

'. . .sleeping in your bed can make a child feel confused and anxious rather than relaxed and reassured.'[32]

It might well be predicted from an evolutionary point of view that it is not the child that sleeps within the close protective embrace of its parent that feels 'confused or anxious,' as Dr Ferber maintains,[32] but rather the child that does not. The potential *psychological* and *emotional* benefits

of co-sleeping for later adult life and among young children, are just now beginning to be published and have been summarised.[61] Children who 'never' slept in their parents' bed show a trend toward them being rated 'harder to control,' 'less happy,' less innovative and less able to be alone[49] and in several studies they exhibit a greater number of tantrums. Children who were never permitted to bedshare were actually *more* fearful than children who always slept in their parents' bed, for all of the night, a finding that is exactly the opposite of what is popularly understood.

- Forbes *et al.*[62] found that co-sleeping children on US military bases received better comportment scores from their teachers, were engaged in more social activities and, compared with children who never slept in their parents bed when one partner went off for assignment, co-sleeping children were 'under-represented in the psychiatric care population.'
- Male college students who had co-slept with their parents between birth and 5 years of age had significantly higher self-esteem, experienced less guilt and anxiety and reported greater frequency of sex. Boys who co-slept between 6 and 11 years of age also had higher self-esteem. For women, co-sleeping during childhood was associated with less discomfort about physical contact and affection as adults.[63,64]
- Crawford found that women who co-slept as children had higher self esteem than those who did not.[65]
- In the largest systematic study to date, conducted in 1400 subjects in Chicago and New York, there were more positive adult outcomes for individuals who co-slept as a child, among almost all ethnic groups (African-Americans and Puerto Ricans in New York, Puerto Ricans, Dominicans and Mexicans in Chicago). An especially robust finding was that co-sleepers exhibited a feeling of satisfaction with life.[66]
- Consistent with Okami *et al.*'s[64] longitudinal study, Maccarin *et al.*[67] showed no differences between bedsharers and non-bedsharers on sleep disturbance, separation anxiety, night terrors and phobias, sexual preoccupation or social competence.

These diverse studies illustrate why the answer to the question of whether or not co-sleeping may have 'outlived its historical usefulness' in technologically advanced cultures is not straightforward. A safe bedsharing context, of course, is defined by the absence of known independent risk 'factors'.[3] In fact, understanding outcomes associated with various sleep locations is impossible without reference to the nature of the relationships around which sleeping arrangements, including bedsharing, take place. The nature of the relationships that co-sleeping parent–infant dyads take to bed are no less important in predicting and assessing outcomes than are the physical structures, furniture and bedding on which they sleep.

TOWARD CLARIFYING DEFINITIONS AND DISCOURSE ON MOTHER–INFANT CO-SLEEPING: CO-SLEEPING VERSUS BEDSHARING VERSUS DANGEROUS CONDITIONS

Mother–infant co-sleeping represents the preferred and obligatory sleeping arrangement for most contemporary people. In many instances there is no other choice for families and, still, even in industrialised western countries without the intense breast feeding and physical monitoring that accompanies co-sleeping, the survival of an infant is threatened. For example, Chen and Rogan[68] found that, even in the USA where infectious diseases do not seriously threaten the lives of infants, approximately 750 American infants die in the first year of life because they were not breast fed. Mothers and infants sleeping side-by-side, co-sleeping, continues to be the universal (species-specific) evolved context that best provides maximum night-time breast feeding nutrition for the highly immature and slow developing human infant.

Despite this fact, so variable is the range of 'factors' associated with one type of co-sleeping i.e. bedsharing which significantly influences outcomes in different families, no single recommendation to bedshare (as one form of co-sleeping) either as a way to reduce SIDS or to enhance the night-time attachment behaviors shared by parents and their children, is appropriate; but neither is it appropriate to recommend in an unqualified way against any and all bedsharing, or especially to advise that no infants should ever sleep with their parent but should always be placed in cribs to sleep alone. Such advice is misleading and unjustified. Without explanations as to what can make the arrangements dangerous, this message confuses species-wide normal, healthy human behaviour with behavioural pathology.

But it remains true that since particular family circumstances remain unknown, bedsharing cannot generally be recommended. However, the convergence of several different epidemiological and laboratory studies, as well as psycho-biological studies of infant primates suggest that particular types of co-sleeping *can* and should be recommended, such as roomsharing (at very least). Following the Japanese lead it is appropriate to recommend that whenever possible and safe to do so, babies should not be left alone to sleep in a room by themselves and should be encouraged to breast feed as much as possible. In this context, co-sleeping refers specifically to infants who sleep on a different surface from their parents, yet remain close enough (ideally, within arms reach) to permit the mutual monitoring and exchange of caregiver–infant sensory signals and cues that define co-sleeping as a unique and, almost always, a beneficial child care practice. *This is why the terms co-sleeping and bedsharing should not be used interchangeably,* since the generic practice of co-sleeping, wherein mothers and infants sleep on a different surface

can be recommended, but due to its complexity and diversity of expression, bedsharing cannot.

One step toward standardising a definition of safe mother–infant co-sleeping is to restrict the phrase to a class of sleeping arrangements in which at least one responsible, safety-educated, *adult* co-sleeper (whether mother or not) sleeps close enough to actively monitor (and/or breast feed) the infant using at least *two* sensory modalities simultaneously, i.e. tactile and visual, or auditory and visual, or auditory and tactile etc etc. Safe mother–infant co-sleeping is thus conceptualised as a generic concept and by the presence of at least one caregiver (usually the mother) capable of potentially detecting and responding to changes in the babies behavioural or physiological status *and by her motivation and ability to do so*.[3,61]

CO-SLEEPING: A MANY DIVERSE THING

'I slept in the same bed with my granddaddy. . .and then in the same bed with my four cousins, I never slept alone 'til I got married' *Bobby Bowden, Head University Football Coach*, Florida State University

'Cosleeping? When both my wonderful children are sleeping at the same time'. *Robert Hahn, Ph.D., Center For Disease Control, Atlanta, Georgia*

Mother–infant co-sleeping takes different forms worldwide.[67,69–72] No singular outcome can be associated with it, unless 'factors' associated with each 'type' are considered. Perhaps the most important issue demanding consensus concerns definitions. Many researchers assume that co-sleeping is a uniform and coherent practice, hence one unsafe co-sleeping arrangement can be thought of as the caricature of all co-sleeping arrangements. The negative social and cultural milieu within which medical researchers approach co-sleeping issues makes such impreciseness, generally not tolerated in other research fields, seemingly permissible. That is why it is important to begin by introducing a new taxonomy of definitions[3,15] and insist that they be used.

The diversity of co-sleeping is truly remarkable. A review of the over 186 cultures for which there is some ethnographic descriptions of night-time sleeping arrangements suggests that traditional western thinking about outcomes associated with particular sleeping arrangements are flawed.[67,69] Many researchers assume that outcomes are sufficiently explained by reference only to where an infant sleeps. But sleep location must be thought of as a beginning point for analysis, not the endpoint. For example, all 'types' of co-sleeping must be distinguished by the condition and composition of the sleeping structures or pieces of furniture or materials that are used, including characteristics of the sleep surface and the bedding materials, including infant sleep wrappings, night clothes and/or blankets, as well as by the people sleeping close to the infant or child–their intentions and motivations and concerns for safety, and by their capacity (in many cases) to breast feed.

Compared with solitary infant sleep, analytically relevant features of the co-sleeping environment are both more numerous and more complex. The quality of parent–infant attachment provides social and psychological meaning to the sleeping arrangement as well,[59,60] which can determine outcome. For example, mandatory, non-elected bedsharing that occurs in households with poor socio-economic conditions, where bedsharing is the only option, where cribs are not affordable, where bottle feeding is practised, will probably lead to outcomes quite different from those situations in which bedsharing is elected by the mother specifically to protect, nurture and breast feed. Indeed, the breast feeding–bedsharing landscape is highly differentiated from the bottle-feeding–bedsharing landscape. For example, compared with bottle feeding bedsharing mothers, breast feeding mothers typically keep their babies away from pillows, position their infants on their backs, placing them below their shoulders, while raising their arms above them. Also, breast feeding mothers, but not bottle-feeding bedsharing mothers, typically tuck their legs up and lay on their sides to face their infants in ways that can prevent accidental overlays.[13]

A consistent feature associated with populations where bedsharing and high infant deaths co-exist is extreme poverty and stressful circumstances including chaotic households. In Alaska, USA, for example, bedsharing occurs among at least 45% of all families and all of the bedsharing deaths reportedly occurred exclusively in the context of heavy drug use.[1] Out of 40 infants who slept with a parent at the time of death only one infant slept in the safe supine position. In this Alaskan sample two infants died from SIDS while sleeping supine alone in a crib.[1] Amongst parents of infants who have died unexpectedly in Great Britain the prevalence of alcohol consumption, cigarette smoking and the use of illegal drugs was higher, whilst the infants exhibited adverse clinical features at birth (prematurity, low birth weight,) and during their short life had repeated infections and poor weight gain suggesting increased vulnerability from the beginning.[21,25] The study also found no evidence to suggest that bed-sharing was a risk amongst parents who did not smoke, or infants aged 4 months or older. Clearly, we need to assess both the acute adverse circumstances and the possible long-term benefits of co-sleeping across diverse cultural groups before simplistic conclusions and recommendations are accepted.

Between 44–75% of mothers and infants sleep in direct bodily contact as in Japan, Guatemala and India.[70] *There exist no ethnographic examples outside of Western, industrialised countries of infants sleeping outside the mother's room—away from her company*. While it is often difficult to extrapolate from these data, there is much indirect ethnographic evidence suggesting that bodily contact between the infant and mother is extensive and usually

associated with baby-controlled night-time breast feeding, although maternal–infant contact is not necessarily skin-to-skin.[70] Specific illustrations of co-sleeping include infants sleeping next to their mothers on floor-based futons, or infants sleeping alongside but not on the same surface as the mother—such as in a crib, or bassinet next to the mother's bed, within arms reach. Co-sleeping also occurs when infants sleep in a basket, cradleboard or in a hammock or when mothers and infants lie beside each other on a bamboo mat on the floor. Side-by-side mother–infant sleep, on the same surface, however, appears to be the most common sleeping arrangement worldwide[69] and it is probably the safest when breast feeding is involved. In a univariate analysis of the Great Britain CESDI data set in which separate room sleeping in a cot/crib was the reference group (odds ratio (OR) = 1.00) the OR and 95% confidence intervals (CI), for babies co-sleeping in the form of room sharing was 0.51 (0.35, 0.74). Partial bedsharing was 0.33 (0.19, 0.57), while for those infants found bedsharing the OR was 1.49 (0.99, 2.24). The highest OR was calculated for sofa sleeping, 15.79 (4.43, 56.24)[21] now confirmed by several other studies[27] to be a dangerous form of co-sleeping.

FROM THE PERSPECTIVE OF THE BREAST FEEDING MOTHER–INFANT DYAD: WHAT DOES IT MEAN TO 'BEDSHARE?'

'Breast feeders are three times more likely to bed share and appear to differ from non-breast feeding bedsharers in several characteristics. These data do not link bedsharing to risk of SIDS.' McKenna *et al.*[76]

In the largest in-house laboratory study yet undertaken, differences in the sleep behaviour and physiology of 70 breast feeding mothers and infants were quantified. This study involved over 105 separate nights in the laboratory, 155 8-hour infra-red video recordings and 210 separate mother and infant (8-hour) polysomnographic recordings as mothers and their infants shared a bed or slept apart (in adjacent rooms), over three successive nights per pair.[73] Two smaller preliminary laboratory studies preceded this large and more complex study.[19,20,73,74] In the larger study we examined specifically how the 'condition' of the solitary sleep environment and the 'condition' of the bedsharing environment affected two 'kinds' of mother–infant pairs—those who routinely bedshared at home and those who routinely slept apart. In the laboratory, in randomly assigned order, each mother–infant pair spent 2 nights sleeping in their routine (home) sleeping condition, and 1 night sleeping in the non-routine condition (routinely bedsharing pairs slept in different rooms, routinely solitary sleepers, bedshared). All mothers and infant were healthy and nearly all exclusively breast feeding. The infants ranged in age from between 11 to 15 weeks, the peak age for SIDS.[18]

The 'choice' to co-sleep specifically in the form of mother–infant bedsharing was found to increase not only the number of breast feeds, but the total nightly durations of breast feeding and to shorten the average intervals between the breast feeding sessions, therein, it can be inferred, regulating mothers fertility. Amongst the 70, nearly exclusively breast feeding Latina mothers, we found that when bedsharing, the average interval between the breast feeds was approximately an hour and a half (the approximate duration of an adult sleep cycle); and when sleeping apart in separate bedrooms the interval was at least twice as long.

On their bedsharing nights we reported that babies often breast fed twice as much as they did on their solitary sleep night.[18] That maternal proximity to their infants regulates breast feeding in important ways has been confirmed by Young and Fleming[69] in England, and by Ball (2003)[13] and her associates at the University of Durham Parent–Infant Sleep Centre who also studied mother–infant bedsharing and what they term 'triadic' bedsharing which involves the father.

Our studies have shown that without instruction, the routinely bedsharing breast feeding mothers almost always placed their infants in the safe supine infant sleep position, probably because it is difficult, if not impossible, to breast feed a prone sleeping infant.[13,42,75–77] We also found that both the mothers and infants spent a good part of their night facing each other, especially the infants who slept facing their mothers for almost 100% of the time. With regard to sleep architecture, both mothers and infants spent significantly less of their sleep period time in stage 3–4 and significantly more time in stages1–2 and both apparently acquire a heightened sensitivity to the activities of the other, as measured by the number of mutual and overlapping arousals scored for routinely bedsharing mother–infant pairs compared with the totals scored for routinely solitary sleeping mother–infant pairs who shared a bed in our laboratory, as Tables 1 and 2 show.

INFANT BREATHING AND HEART RATE PATTERNS IN THE BEDSHARING AND SOLITARY SLEEP ENVIRONMENTS

The bedsharing environment is also associated with more central apnoeas, fewer obstructive apnoeas and more periodic breathing in infants than the solitary environment (although the clinical significance of these differences cannot be assessed.[78] Thus, during bedsharing, irrespective of the routine sleeping arrangement at home, the infant experiences a higher frequency of central apnoeas during stages 1 and 2 and during rapid eye movement (REM) sleep. Among routinely solitary sleeping infants, who slept with their mothers in the same bed in the laboratory, this increase largely reflected an increase in the shortest

apnoeas (3–5.9 s) while in stage 1–2. In routinely bedsharing infants, it reflected increases in apnoeas in the 6–8.9 s range during REM and in the range of 9–11.9 s during stage 1–2. In contrast to central apnoeas, however, obstructive apnoeas were decreased by bedsharing, but only among routinely solitary sleeping infants (while bedsharing) who had a lower frequency overall and specifically in stages 1–2 and in REM sleep.

Periodic breathing was also significantly increased in the bedsharing environment. Routinely bedsharing infants had a higher frequency of periodic breathing and a longer mean duration over the entire night (overall) while bedsharing and, specifically, during REM. Routinely solitary sleeping infants exhibited more frequent periodic breathing only during stages 3–4, while bedsharing in the laboratory with their mothers.

Regarding heart rate, irrespective of whether or not an infant routinely bedshared or routinely slept apart from its mother, Richard and Mosko[79] found that heart rate was lower during solitary sleeping than during bedsharing in all sleep stages. They concluded that 'sensory differences between bedsharing and solitary sleeping environments account for some of the differences between infant sleep in the two sleeping conditions.'

SIDS BEDSHARING EPIDEMIOLOGY AND CATASTROPHIC 'OVERLAYS'

'The findings suggest that it is not bedsharing per se that is hazardous but the particular circumstances in which bedsharing occurs.'

'There is no published evidence of any increased risk to a baby from sharing a bed with a firm mattress with parents who do not smoke and have not consumed alcohol or other drugs providing the bedding is arranged so that it cannot slip over the baby's head, and the baby is not sleeping on a pillow, or under an adult duvet.'[68]

'Sixteen percent of SIDS were attributed to bedsharing and roughly 36% to the baby sleeping in a separate room.'[23]

Bedsharing in impoverished, high risk urban environments can be associated with increased SIDS risks and/or accidental deaths. Do these findings preclude the possibility that under different social, familial and economic circumstances, safe bedsharing or other forms of co-sleeping cannot be beneficial or protective, or at the very least, benign? That because some are unable or unwilling to practice safe co-sleeping in the form of bedsharing, does it mean that nobody can, therein justifying public health policies and recommendations against it and the removal of brochures as to how to maximise bedsharing safety for those parents who choose to do so? These two questions constitute an important part of the bedsharing debate. Surely, the fact that in Japan safe bedsharing and futon co-sleeping is increasing as SIDS rates decline to unprecedented levels should raise some doubts about any singular or predictable positive association between bedsharing and SIDS rates. Moreover, data on recent Asian immigrants in the USA lead to an interesting observation: the longer different Asian immigrant sub-groups live in the USA and presumably begin to adopt American life styles, including placing their infants in cribs for night-time sleep rather than co-sleeping, the more the SIDS rates of these ethnic groups begin to rise to match the higher rates of SIDS among whites.[80]

Blair *et al.*[21] argue against a simplistic analysis of expected 'outcomes' associated with bedsharing. Indeed, as has been argued above, it is an appreciation of how particular *combinations* of risk factors converge to affect outcomes relating to bedsharing in different subgroups and how difficult these variables are to decompose statistically, that make global, unqualified statements claiming that bedsharing/co-sleeping increases SIDS risks inaccurate and scientifically unjustified. No data from the Great Britain CESDI study, nor, according to two of the authors (P. Fleming and P. Blair) from a now controversial paper describing the European collaborative study by Carpenter *et al.*,[23] support the idea that bedsharing among non-smoking breast feeding parents increases the risks of SIDS. Blair describes his epidemiological model, which examines bedsharing behaviour *not as a risk factor itself, but as a particular kind of environment within which specific risks may or may not appear.*

In contrast, in a four-year retrospective study which included a disproportionately high number of high risk poor, urban, African-Americans, Kemp *et al.* (2000) concluded that their data proved that all bedsharing increases the chances of a SIDS or asphyxial death and should therefore be advised against.[28] The same ideas, findings and approach are expressed by Scheers *et al.*[30] but it should be noted that Kemp was part of the CPSC research team and the spokesman for the Scheers *et al.* paper. They analysed incomplete and often anecdotal data on infant deaths in beds versus cribs, data reported by coroners and police officials to the US CPSC. Using deaths for which no details were available on items such as infant sleep position, or whether or not the bedsharing involved bottle or breast feeding, drug use, smoking, or other children etc, or if infants were left alone on beds, Scheers *et al.* (2003) reported that compared to crib sleeping, bedsharing increased by a factor of 20–40 the chances of an infant dying.[30] These researchers used, in our opinion, an unrealistically low percentage for population-wide bedsharing (about 18–29%), to calculate relative risks, where a more appropriate figure would include part-time bedsharing and is probably over 50%. (5–7) But what weakens their conclusions and interpretations is that no information was available as to how many of these deaths involved breast feeding infants who traditionally are under-represented statistically in such SIDS samples and how many of these bed deaths could

be explained by the dangerous specific ways their beds were used.

Clearly, the meaning of 'controlling' for factor X or Y in socially and economically disadvantaged populations—or any case control studies—where many bedsharing infant deaths occur may be more complicated than explaining infant deaths occurring in a populations characterised by more normally distributed income levels based on national averages. Breast feeding rates, for example, associated with young African-American mothers who bedshare and experience high SIDS (especially in the Kemp *et al.* sample) can be as low as between 10–20%[81] Compare this overall situation with more affluent, white mothers among whom bedsharing rates for at least part of the night have probably doubled in the last decade, with between 55–73% breast feeding, yet, experiencing the most dramatic decline in SIDS of any ethnic subgroup.

These facts argue against the Scheers *et al.* conclusion that, regardless of circumstances and context, bed use leads inevitably and inalterably to higher infant death rates. Similar data, i.e. high bedsharing associated with high breast feeding rates associated with relatively low SIDS amongst non-smoking mothers is found also in Japan, Great Britain, Australia and New Zealand, casting further doubt on the position that a simple positive linear relationship exists between all types and forms of bedsharing and higher SIDS.

Indeed, it seems appropriate to suggest that populations experiencing economic deprivation and health stress where little or no breast feeding occurs fall well short of representing the best populations from which reliable inferences about the inherent dangers of co-sleeping or potentially protective functions of safe bedsharing with breast feeding can be drawn, a point many SIDS researchers continue to dismiss, including the American Academy of Pediatrics.

No epidemiological study to date has included a sufficient number of exclusively breast feeding, non-smoking, safe bedsharing mother–infant pairs to know if this arrangement can be, as has been hypothesed, protective; and the very fluidity of SIDS classification in general raises questions about the role of coroners, especially since they often rule that any bedsharing death (regardless of context, factors, or conditions) is an asphyxiation rather than a SIDS[82] therein affirming a priori views and creating a self-fulfilling statistical prophecy.

BOTTLE FEEDING–BEDSHARING MOTHER–INFANT DYADS AND BREAST FEEDING–BEDSHARING MOTHER–INFANT DYADS ARE NOT THE SAME!

'Bad science sets out to make a point, looks neither to the left nor to the right but only straight ahead for evidence that supports the point it sets out to make. When it finds evidence it likes, it gathers it tenderly and subjects it to little or no testing'. *Mark Vonnegut, The Boston Globe, October 1999*.

Breast feeding and co-sleeping, including breast feeding in the context of bedsharing, are often mutually reinforcing and constitute an integrated system. That is, the choice to breast feed leads in many cases to increased bedsharing behaviour, which, in turn, increases the number of breast feeds per night, while facilitating decisions by mothers to breast feed for a greater number of months (Fig. 3). We argue, as does UNICEF, that it is necessary and appropriate to differences in outcomes to separate the breast feeding–bedsharing dyad from the bottle feeding–bedsharing mother–infant dyad. 'Circumstances and conditions' associated with bedsharing can always range from safe to risky, regardless of whether the co-sleepers sleep on the same or a different surface but when breast feeding is involved outcomes always take a step toward the positive. We suggest, therefore, that bedsharing outcomes are best conceptualised as falling somewhere on a benefits–risk continuum with outcomes being determined by the presence or absence of known adverse or protective 'factors' (see Fig. 4). For example, when non-smoking breast feeding mothers elect to bedshare specifically to nurture their infants having eliminated all known factors associated with risky bedsharing, the outcomes will probably be very positive compared with the 16-year-old unsupported mother, who bottle feeds and bedshares because she cannot afford a crib and places her infant on a pillow in the bed to sleep.

Breast feeding promotes bedsharing, which increases breastfeeding frequency and extends duration of breast feeding in months.

A mutually re-enforcing system

Figure 3 Infant–parent co-sleeping with breast feeding: why it can be seen as a mutually re-enforcing system.

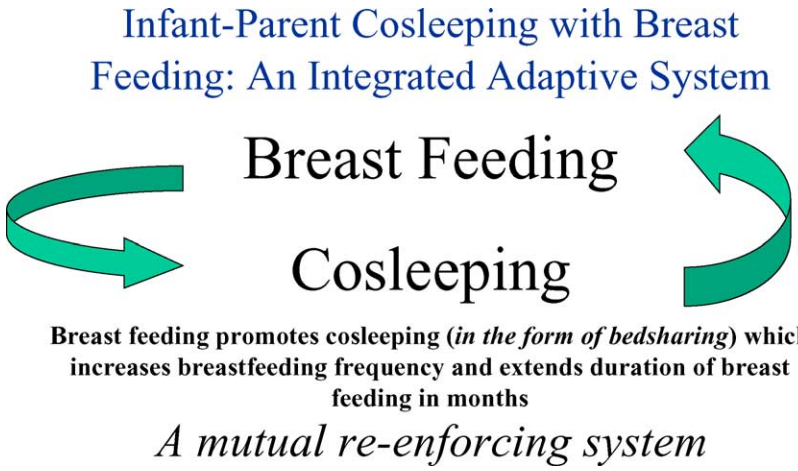

Figure 4 Bedsharing outcomes are best conceptualised as falling along a benefits–risks continuum with degree of risk or protection from sudden infant death syndrome (SIDS) being determined by the presence or absence of breast feeding behaviour and independent adverse risk factors.

Most importantly it is necessary to publicly acknowledge the social and legal legitimacy of mothers or fathers making a proactive choice to 'co-sleep' when done safely. Not to do so will seriously limit the degree of mutual access health professionals and co-sleeping parents have to each other, therein reducing opportunities to discuss what it means to sleep safe with baby.

Moreover, as is the tendency in Western societies, if all forms of co-sleeping are deemed officially to be dangerous and irresponsible behaviour on the part of a parent, then it is not inconceivable that well meaning child protective agencies will attempt to use 'co-sleeping' as a reason to take or threaten to take infants away from their families claiming abuse or neglect. Moreover, one of the most deleterious effects of the sweeping condemnation of bedsharing is its potentially negative impact on breast feeding at the very moment historically when it is quickly becoming the new cultural norm.

Beginning in 1992 with the launch of the 'Back to Sleep' campaign in the USA not only did SIDS rates begin a steady decline, which presently amounts to about 42% in the USA (as parents began to lay their babies supine for sleep), but simultaneously there began a significant upward trajectory across all ethnic groups of mothers choosing to breast feed and to breast feed for a greater number of months (Figs. 5 and 6). The fact that bedsharing can make the management of breast feeding easier apparently acts to increase the likelihood that mothers will be willing to extend breastfeeding into the second half of the infant's first year of life, goals for which the World Health Organisation, Baby Friendly Hospitals, UNICEF and the United Sates Breast Feeding Committee are all committed. Furthermore, it could be the case, although study techniques and methods are unable to provide the kind of data needed at this point to demonstrate it, that increased international breast feeding rates, combined with safe part-time bedsharing and the use of the safe supine infant sleep position with which breast feeding is associated, could be contributing to, and/or enhancing the international decline of SIDS in western countries which followed the back-to-sleep campaigns worldwide.

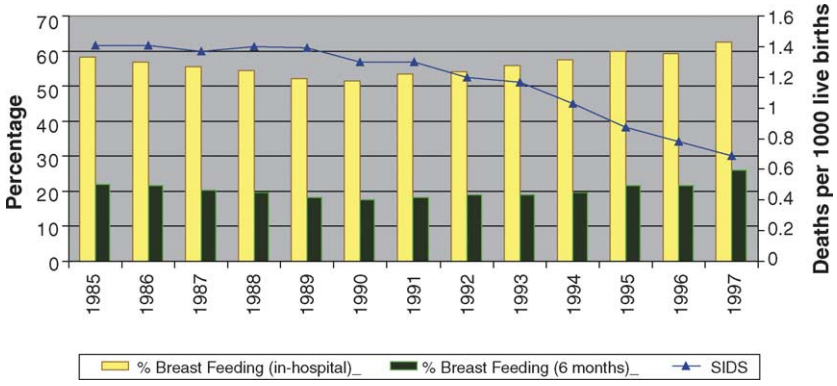

Figure 5 United States sudden infant death syndrome (SIDS) rates and national breast feeding rates (in-hospital and at 6 months) from 1985–1997. The data show that the dramatic decline in SIDS cases, beginning with the 'Back-To-Sleep-Campaign' in 1992, occurred in relation to a significant upward trajectory of increased breast feeding.

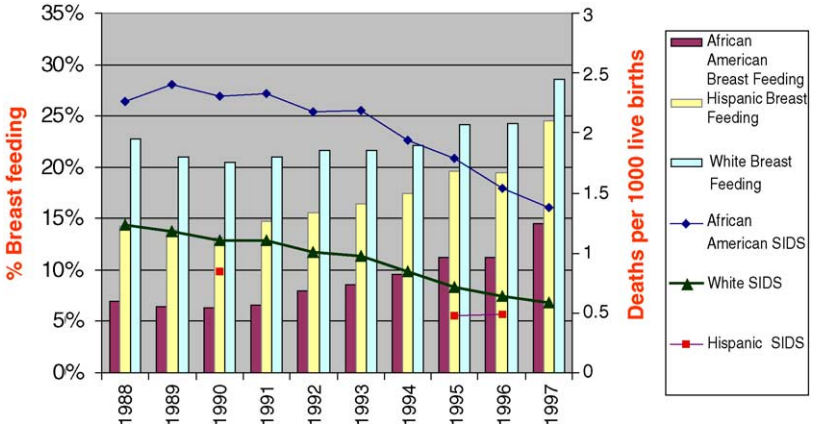

Figure 6 SIDS rates and percentage breast feeding by ethnic group, 1988–1997. African Americans who have the highest SIDS rates exhibit the lowest breast feeding rates.

While no multivariate epidemiological study has yet shown that breast feeding alone protects infants from SIDS, a variety of lifestyle markers, such as routine household activity patterns, breast feeding and co-sleeping in the absence of drugs and smoking and increased contact between infants and their mothers are known to be associated with reduced infant mortality, whether from SIDS or from some other infant malady. Breast feeding alone can save as many as 750 infant lives each year. A decade earlier Fredrickson *et al.*[83] analysed national infant–maternal health statistics and considered breast feeding intensity and duration in months. They found a small SIDS protective factor that increased the more intensely mothers breast fed and the longer the mothers breast fed in months suggesting that the degree to which breast feeding may be protective of SIDS is dose specific.

That a decision to bedshare is linked to the practice of breast feeding in specific ways is further supported by a recent NIH-sponsored survey of 10 355 mother–baby pairs in infants born between 1995 and 1998 in Massachusetts and Ohio, where it was found that 22% of the 1 month old babies were bedsharing with their mothers. The authors reported that overall bedsharing was common among infants being breast fed, or common among unmarried young mothers, or minority mothers, or mothers with low incomes. The authors found that breast feeders were three times more likely to bedshare and that their data did not link bedsharing to risk of infant death.[5,7]

In northern England, Ball *et al.*[4] found that they would have missed half of the routine co-sleepers (bedsharers) had the researchers not asked if the baby was moved or relocated to sleep in a different location at some point in the night! They describe why working class parents in North Tees, England changed their sleeping arrangements from crib to bedsharing. 'Bringing the baby into their bed to sleep was described as an 'intuitive' strategy by many new parents,' the authors stated. This research raises the possibility that the true frequency of co-sleeping has been grossly underestimated in western countries where parents traditionally confront social criticisms for bedsharing.

The Problem and Paradox of Differing Co-sleeping Outcomes

Cultural expectations including personal world views, preferences and experiences are much more likely to play a significant role in interpreting and using scientific data in situations where the data collected is complex and/or inconsistent. This is exactly what occurs when sleeping arrangements are considered. For example, in some cultures and subgroups co-sleeping is associated with reduced infant deaths, while in others it is associated with increased deaths. Sankaran *et al.*[84] present data from Saskatchewan Canada, showing that where breast feeding and forms of co-sleeping co-exist, SIDS are reduced. In South Africa, bedsharing babies have higher survival rates than solitary sleeping babies.[8] Similarly, in Hong Kong, where co-sleeping is the norm, the rates of SIDS are among the lowest in the world.[84] SIDS and infant mortality rates in general are decreasing to record low levels in Japan in parallel with increases in nighttime 'bedsharing'. In most other Asian cultures where co-sleeping is also the norm (China, Vietnam, Cambodia and Thailand) SIDS is virtually unheard of (Fig. 7).[85–87]

But among urban, economically marginalised, minority groups, however, where past and present institutional racism converge to account both for inter-generational poverty and the presence of multiple, related risk factors, bedsharing is associated with high numbers of infant deaths, either from SIDS or accidental asphyxiations and involve sleeping in or around unsafe sleep surfaces. This is especially true in the USA among African-Americans living in large cities such as Chicago, Cleveland, Washington D.C. and St. Louis. Epidemiological studies conducted in New Zealand and Great Britain and data from Canada and Australia also show that across marginalised, sometimes indigenous, groups such as the Maori from New Zealand, Aborigines

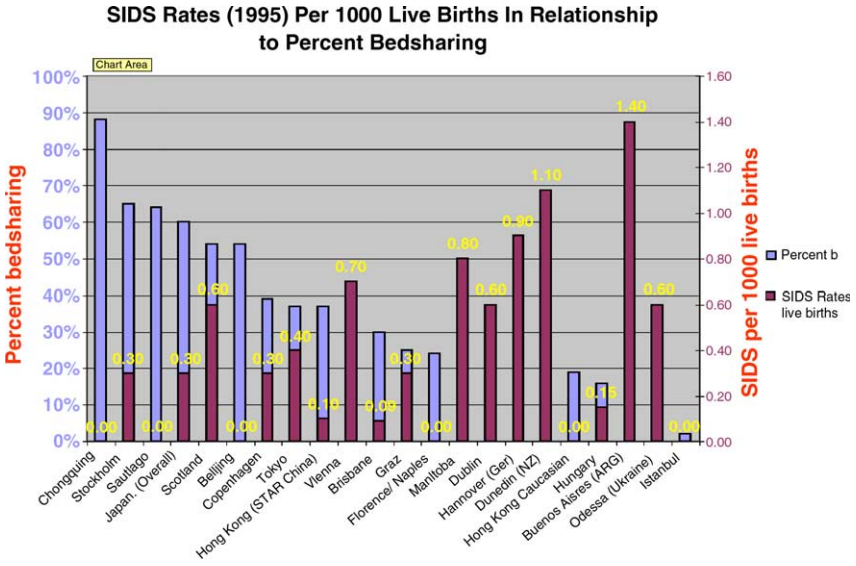

Figure 7 Sudden infant death syndrome (SIDS) rates in relation to percentage of societal bedsharing (per culture, country or region). Contrary to what would be predicted by those arguing a linear, simple relationship between bedsharing and SIDS, some of the lowest SIDS rates are associated with the highest bedsharing or co-sleeping geographical or cultural entities. Source: SIDS Global Task Force Child Care Study – Nelson et al, 2001.[90]

from Australia and Cree from Canada, bedsharing or other forms of co-sleeping can increase risks significantly but especially when associated with maternal smoking and other specific modifiable factors.[88]

But What Is Bedsharing and a Bedsharing Death?

Such disparities in outcomes associated with the 'same' practice suggests three things: that a close examination of the details of any one bedsharing/co-sleeping death is critical to understanding causation; that attention must be paid to how authors define co-sleeping, bedsharing and a 'bedsharing death;' and, finally, that it is highly unlikely that any one single (one-size-will-fit–all), population-based, rather than family-based, recommendation either promoting bedsharing, or recommending against it is appropriate because outcomes appear to be context-specific.

Only the British CESDI study includes an analysis of bedsharing in terms of the many 'factors' that differentiate one 'type' from another and, even here, the outcomes for non-smoking, breast feeding, bedsharing mother–infant pairs is not known, since there were too few pairs with this 'type' of bedsharing associated with these particular 'factors' in the sample population.

Unfortunately, much of the debate over the relationship between SIDS and specifically bedsharing (as one form of co-sleeping) continues to involve data either too incomplete or too limited to be able to carefully or accurately delineate the relationship. For the most part many researchers continue to use ambiguous and/or widely varying inclusion criterion for defining bedsharing or co-sleeping, apparently assuming that since all co-sleeping is inherently dangerous then 'splitting hairs' over diverse bedsharing or co-sleeping factors or contexts, i.e. differences, is unnecessary if not irrelevant and serves only to limit the opportunities to give to the public one simple message: never sleep with baby. In an Irish epidemiological study, for example, the conclusions suggested that co-sleeping in the form of bedsharing with breast feeding, where no drug use was involved, was deemed no less risky than obese bottle feeding mothers sleeping with their infants on recliners, couches or sofas.

While researchers who conduct these studies may dismiss the importance of the details in explaining any given infant death, parents do not. Indeed, we suggest here that it is not the researchers prerogative to decide which hazards are worth working on to eliminate or which hazards any given family can be eliminated. It remains the right of parents to make informed decisions, which requires access to unbiased information exchanged within an appropriately relaxed and non-judgmental educational venue. Regardless of what some may decide for themselves, sleeping with ones baby is not bad, irresponsible or criminal behaviour but, for the most part, it is merely normal and expectable and, for the overwhelming number of parents, can be a good choice based on protective emotions and affectionate parental behaviour toward which all healthy parents are at some point inclined.

SUMMARY

'We believe it is inappropriate to fundamentally condemn the practice of bedsharing by professional advise. In parental counselling, the individual child's needs, the family

context, and cultural background need to be taken into account' *Jenni et al. (2005)*[89]

The rejection by the media of Commissioner Ann Brown's recommendation against 'sleeping with baby' in the USA and the public controversy generated by papers by Nakamura *et al.*,[29] Drago and Dannenberg[24] and, more recently, by Scheers *et al.*,[30] provide many good reasons to insist that the definitions of different types of co-sleeping and bedsharing be recognised and distinguished. No benefits associated with co-sleeping are acknowledged in the above reports, no attention is given to why the powerful motivation to sleep next to an infant persists, or why and how safe forms of co-sleeping in the form of safe bedsharing can be practised. No mention is made about the intimate biological connection between breast feeding and forms of co-sleeping and how infant proximity and contact sustained by co-sleeping saves infant lives and is fundamental to human life. In much public health discourse there is no consideration that mother–infant co-sleeping is being biologically appropriate and that while forms of co-sleeping can most certainly be made dangerous, it is not inherently so and that a decision to co-sleep can be a responsible choice reflecting how parents desire to best nurture their infants, to maximise their infants well being, including their chances to survive.

There is no reason to suppose that co-sleeping evolved to protect infants specifically against SIDS, or that solitary crib sleeping 'causes' SIDS. Nor do we assume that, should it exist, the protective effect we propose for safe bedsharing with breast feeding is necessarily large. Indeed, since the potential positive outcomes we propose are dependent on a particular context and set of circumstances within which the bedsharing occurs, any singular, sweeping recommendation in favour of bedsharing is as inappropriate as is a sweeping recommendation advising against it.

The general hypothesis that co-sleeping (at least in the form of a committed caregiver's proximity i.e. roomsharing) reduces SIDS among some SIDS prone infants is confirmed by studies showing that roomsharing in the presence of an active caregiver saves lives. This hypothesis emerged initially from considering the evolutionary function of mother–infant co-sleeping and breast feeding, both among human and non-human primates and the underlying physiological systems of the human infant, which are positively regulated by the contact that such proximity asserts.[3] In addition, previous works emerged in response to unexplained observations that among many cultural groups, co-sleeping among non-smoking mothers is associated with remarkably low SIDS and infant mortality. These reports are confirmed by a recent worldwide childcare survey by the SIDS Global Task Force led by Nelson *et al.*[90] This international survey team of over 20 scholars revealed that, compared with crib sleeping cultures, those cultures practising the highest co-sleeping and bedsharing rates experienced either the lowest SIDS rates of all, or 'low SIDS awareness.' Consistent with the scientific biases against co-sleeping described above these data were defined by the authors in the paper as a 'paradox.' Obviously, the findings were quite the opposite of what was expected, which was the more the bedsharing, the higher the SIDS. Our guess is that the term 'paradox' would not have been used had the data supported the authors a priori assumptions that high SIDS would be found associated with high rates of co-sleeping.

A different way to interpret overall the US CPSC database and the data derived either from poor, high risk urban minority populations, or from studies which fail to make important distinctions as to what specific kind of co-sleeping or bedsharing has occurred, or which fail to include detailed information on how exactly infants have died, is to realise that these studies indicate that the major question is not whether, or if, co-sleeping should occur as defined generically—meaning, infants on different surfaces but in proximity to their committed caregivers—but rather, how it should occur. In particular, the CPSC data in the USA represent the strongest evidence showing why infants should never sleep outside the supervision of a responsible adult caregiver.

The studies and data described in this paper, which show that co-sleeping at least in the form of roomsharing especially with an actively breast feeding mother saves lives is a powerful reason why the simplistic, scientifically inaccurate and misleading statement 'never sleep with your baby' needs to be rescinded, wherever and whenever it is published.

CONCLUSIONS

'Pediatricians need to recognize the cultural environments in which children live and how cultural beliefs and values interact with the needs of the individual child and with the biological characteristics of his or her sleep patterns' *Jenni and O'Connor.*[91]

Discussions about infant and childhood sleeping arrangements will benefit by moving away from the notion that a single recommendation is appropriate. In a recently published supplement to Pediatrics[92] on '*Cultural Issues and Children's Sleep: International Perspectives'* for the first time a serious attempt was being made to broaden the overall understanding of the complexity of infant development and childhood sleep, sleep problems and sleeping arrangements. One inference that can be drawn from this collective work is that overall the traditional paediatric research paradigm must change, not only to become more scientifically accurate but to be more effective in helping and accommodating the diverse families and circumstances health clinicians and physicians are increasingly being asked to serve. The relationships between infant sleep patterns, infant sleeping arrangements and development both in the short and long term, whether positive or negative outcomes, is anything but simple and the traditional habit of

labelling one sleeping arrangement as being superior to another without an awareness of family context not only is wrong but possibly harmful.

This discourse on bedsharing as one form of co-sleeping should move away from traditional epidemiological approaches where 'bedsharing' is conceptualised as a discrete variable, with a fixed relative risk. Health educational programs and written materials aimed at teaching parents how to arrange a safe sleep environment should appreciate and accommodate the potential fluidity of sleeping arrangements in any given family and respond to the reality that many infants experience multiple sleep locations and arrangements, both social and solitary, thereby encountering a rich variety of sensory experiences and physical circumstances.

Indeed, ethnographic studies reveal that many parents never really make a firm decision about where their baby will sleep; nevertheless sleep happens and when and wherever it does parents should be alert and made knowledgeable as to the special precautions each location or arrangement requires.

The first step in reconciling social and scientific biases is to acknowledge that they exist. It is hoped that this article will further facilitate a major shift away from the traditional narrow way of thinking about legitimate sleeping arrangements among infants and children, to considerably broaden the larger related question about what constitutes, healthy, safe and satisfying infant–child sleep. This shift must now include the idea that co-sleeping can be one of several 'healthy' choices, especially where parents are provided with supportive education on how to make that choice and how to practise that choice safely.

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