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Relationship Between Bed Sharing and Breastfeeding: Longitudinal, Population-Based Analysis

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KEY WORDS

sudden infant death syndrome, bed sharing, breastfeeding, social class, latent class analysis

ABBREVIATION

SIDS—sudden infant death syndrome

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FINANCIAL DISCLOSURE: The authors have indicated they have no financial relationships relevant to this article to disclose. **WHAT'S KNOWN ON THIS SUBJECT:** Bed sharing is a widespread practice, but it has been implicated in rare accidental or sudden deaths. Before advising against such a practice, we need to understand better the different groups that share beds and the potential association with breastfeeding.

WHAT THIS STUDY ADDS: An analysis of bed sharing and breastfeeding over time suggests an interdependent temporal relationship, with demographic differences between families that share beds mainly in infancy and those that share beds later in childhood.

abstract

OBJECTIVES: This is an investigation into the longitudinal patterns of bed sharing, the characteristics associated with those patterns, and the relationship with breastfeeding.

METHODS: The study used prospective, population-based data from the United Kingdom to investigate nocturnal bed sharing at 5 time points from birth to 4 years of age. Of 14 062 live births, 7447 (53%) had data available for all time points.

RESULTS: Latent class analysis identified 4 mutually exclusive groups, broadly described as nonsharers (66%), early bed sharers (only in infancy) (13%), late bed sharers (after the first year) (15%), and constant bed sharers (throughout the 4 years) (6%). The boy/girl ratio and the proportion of families of nonwhite ethnicity were slightly higher in all 3 bed-sharing groups, compared with the non-bed-sharing group. Higher maternal educational achievement and higher social class were positively associated with early bed sharing, negatively associated with late bed sharing, and not associated with constant bed sharing. The 3 bed-sharing patterns were related significantly to breastfeeding at 12 months (P < .001), whether the families shared beds late (odds ratio: 1.72 [95% confidence interval: 1.36-2.18]), early (odds ratio: 2.36 [95% confidence interval: 1.87-2.97]), or for the whole period (odds ratio: 5.29 [95% confidence interval: 4.05-6.91]). The prevalence of breastfeeding was significantly higher among the groups that shared beds constantly or early for each of the first 15 months after birth.

CONCLUSIONS: Advice on whether bed sharing should be discouraged needs to take into account the important relationship with breastfeeding. *Pediatrics* 2010;126:e1119–e1126

Bed sharing (parent and infant sleeping in the same bed) is a normal infant care practice in many different cultures and is practiced commonly in Western society. In England, almost one-half of all neonates share beds with their parents at some time and one-fifth of infants are brought into the parental bed on a regular basis during the first year of life.¹ Parental beds, particularly in Western societies, are not designed with infant safety in mind, however, and bed sharing has been implicated in rare accidental infant deaths attributable to entrapment or parental overlaying.² In the past decade, epidemiological studies investigating sudden infant death syndrome (SIDS) have shown a marked decrease in total numbers of SIDS deaths, with decreased proportions of deaths occurring in infant cribs; however, there is no evidence of any increase over time in the absolute numbers of SIDS deaths during bed sharing.^{3–6} Findings from our recently reported study performed in southwestern England⁷ suggest that it is not so much bed sharing itself but the circumstances in which parents may share the bed that put infants at risk (in particular, parents drinking alcohol, consuming drugs, or sleeping on a sofa), findings supported by data from Alaska for a 13-year period from 1992 to 2004.8 Simply advising against bed sharing, as the American Academy of Pediatrics did,⁹ led to an unusual level of criticism,^{10–13} which was attributable in part to the unique relationship between bed sharing and breastfeeding. Both cross-sectional epidemiological^{1,14–16} and sleep laboratory^{17,18} studies showed close links between the frequency and duration of breastfeeding and the practice of bed sharing. However, the question of whether bed sharing facilitates breastfeeding, breastfeeding leads to bed sharing, or both is difficult to answer definitively.15

We report the results of an investigation to determine patterns of parentinfant bed sharing during infancy and childhood by using an established longitudinal cohort of parents and their children monitored from birth in Avon, England, since 1991. Specifically, we wanted to examine the characteristics associated with various longitudinal patterns of bed sharing, with the particular aim of clarifying the relationship with breastfeeding.

METHODS

Avon Longitudinal Study of Parents and Children

The former English county of Avon has a predominantly white population, with a mixture of urban and rural communities and a socioeconomic mixture similar to that of the rest of the United Kingdom. The Avon Longitudinal Study of Parents and Children is a prospective cohort study that aimed to enroll the infants of all pregnant women who were residing in the 3 Bristol-based health districts of the county of Avon (population: 940 000) with an expected date of delivery between April 1, 1991, and December 31, 1992. A total of 14 062 live-born infants were recruited to the cohort within this 21-month period, and 13 988 infants survived the first year of life (84% of all eligible infants in the study area). Information was collected initially both from parent-completed questionnaires and from clinical records. Successive questionnaires and direct contacts collected information on a wide range of aspects of the lives, health, growth, and development of the infants in the study and their parents. Methodologic details of the study were published previously,^{19,20} and additional information, including the questionnaires used, is available at www.alspac. bris.ac.uk.

The study was approved by the local research ethics committees, and the

study incorporated its own ethics and law advisory committee.²¹ The Strengthening the Reporting of Observational Studies in Epidemiology guidelines were followed in this article where possible.²²

Variable and Outcome Definitions

Postal questionnaire information was collected on sleeping practices (including where and when the infants and children and their parents slept) and on feeding practices (in particular, whether infants were breastfed and for how long breastfeeding continued). For the purposes of this study, bed sharing was defined as an infant or child usually spending some of the nocturnal sleep in the same bed as an adult. Breastfeeding information was collected at several time points; breastfeeding duration determined at 15 months (and verified against earlier information) was used for this analysis. More than 10% of the infants in the cohort were still breastfeeding at 12 months; therefore, this was used as a cutoff time to investigate significant markers of long-term breastfeeding. The families in this cohort were predominantly white, and the remaining ethnic groups, the largest of which were black Caribbean and Asian, were grouped together as a nonwhite minority. Social class was based on the UK Registrar General's occupational classification (I, professional; II, intermediate; III, skilled; IV, partly skilled; V, unskilled). In the United Kingdom, education to the degree level is defined as at least bachelor's degree level and is equivalent to the last 3 years of the bachelor's degree in the United States.

Statistical Methods

In the present study, we used longitudinal latent class analysis with the statistical package Mplus (Muthén and Muthén, Los Angeles, CA) to investigate the patterns of bed-sharing prevalence over time. Like cluster analysis,

longitudinal latent class analysis is an exploratory technique that attempts to group the respondents into a number of unmeasured (latent) groups or mutually exclusive classes to explain the variability in response patterns. Various stopping criteria are used to establish the optimal number of classes (ie, the minimal number of classes required to obtain an adequate model fit). Unlike cluster analysis, the longitudinal latent class analysis method works with probabilities rather than absolute values by providing a set of class-assignment probabilities for each person, allowing people to be fractional members of all classes to a lesser or greater degree. A series of models with an increasing number of classes are fitted, with the best model being chosen on the basis of the bootstrap likelihood ratio test,²³ the Bayesian information criterion.²⁴ and entropy,²⁵ as well as the face validity of the resulting profiles of behavior. The second stage of this procedure, the assessment of the relationship between the resulting latent classes and both covariates and later outcomes, was conducted by using probabilityweighted binary and multinomial logistic regression analyses within Stata 7 (Stata Corp, College Station, TX), including calculation of multinomial odds ratios (described in Stata as relative risk ratios). More details on this 2-stage approach can be found in an earlier paper.²⁶

Data on the sleeping environment were collected at 8 time points (0–2 months, 6–8 months, 17–20 months, 30-33 months, 42–45 months, 69–72 months, 80–84 months, and 115–119 months) but, because bed sharing was relatively uncommon as a routine practice beyond 42 to 45 months, we concentrated on data from the first 5 time points in this analysis. To achieve consistent denominators across the time points and best estimates for the **TABLE 1** Comparison of Families That Provided Bed-Sharing Data at All 5 Time Points (N = 7447)and Those That Did Not (N = 6541)

Characteristic	Proportion, %		Р
	Provided All Bed-Sharing Data	Did Not Provide All Bed-Sharing Dataª	
Male	51.7	51.6	.86
Nonwhite	3.3	7.6	<.001
>3 children ^b	5.0	8.0	<.001
Preterm (≤37 wk)	9.4	13.7	<.001
Low birth weight ($<$ 2500 g)	3.7	7.4	<.001
Maternal social class I or II	40.3	32.4	<.001
Maternal education (degree/level)	15.5	9.1	<.001
Young mother (<21 y)°	3.3	11.7	<.001
No partner	1.7	3.9	<.001
Multiple birth (twins or triplets)	1.7	3.6	<.001
Maternal smoking (ever smoked) ^d	45.8	57.1	<.001
Breastfeeding duration of \geq 12 mo	10.6	7.0	<.001
Bed sharing			
0–2 mo	9.2	9.0	.82
6—8 mo	14.0	15.4	.05
17–20 mo	15.8	18.3	.001
30–33 mo	20.8	24.6	<.001
42–45 mo	18.0	20.9	.001

 $^{\mathrm{a}}$ Calculated for the 6541 subjects (13 988 subjects - 7447 subjects) who did not have data on bed sharing for all 5 time points.

^b Including study subject.

^c No significant difference among older mothers (>35 years of age).

^d Mothers who smoked or had a history of smoking.

latent class approach, we opted to concentrate on the children whose parents provided data on bed sharing for all 5 of the time points studied. A subsequent analysis of the larger data set also was conducted.

For the regression analyses, multivariate models were constructed by using the backward stepwise procedure for variables that were significant at the 5% level in univariate analyses. Any variables with >5% missing data were tested at the end of the modeling process.

RESULTS

We had complete data on the sleeping environment at 0 to 2 months, 6 to 8 months, 17 to 20 months, 30 to 33 months, and 42 to 45 months for 7447 study subjects (53.3%). Table 1 shows that the subjects excluded from the analyses tended to represent moredeprived families (as indicated by a range of markers, including maternal education, social class, maternal smoking, maternal age, and family size) and more-vulnerable infants (eg, preterm, low birth weight, multiple birth, or bottle fed). Among the excluded infants, the proportions of bed sharers were no different for the first 2 time points but were significantly greater for the remaining 3 time points.

Figure 1 shows the proportions of parents at each postnatal age who reported regularly sharing beds with their infants or young children. The proportions increased from 12% at 0 to 2 months, peaking at 22% at 30 to 33 months. This cross-sectional approach also revealed, however, that the bed sharers represented very different groups at different time points; only one-third of families who shared beds at 6 to 8 months shared beds at 0 to 2 months, and less than one-half of families who shared beds at 17 to 20 months were sharing beds at either of the earlier time points. This difference in group characteristics between time points was further demonstrated in examinations of socioeconomic mark-

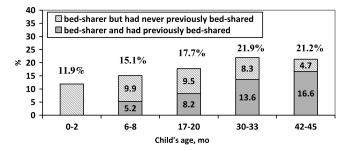
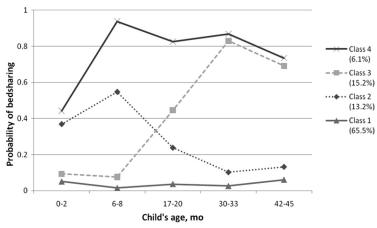


FIGURE 1

Proportions of the population usually sharing beds at various time points, with identification of those who had never shared beds previously.





Latent class analysis of bed-sharing prevalence over time, using 5 time points and 4 latent classes. The 4 latent classes depicted here included a group that shared beds rarely (class 1; 65.5%), a group that shared beds for most of the time periods (class 4; 6.1%), a group that shared beds generally in infancy (class 2; 13.2%), and a group that shared beds in later childhood (class 3; 15.2%).

ers. At 0 to 2 months, 29% of the bedsharing mothers (251 of 872 mothers) were educated to degree level, compared with 14% of mothers (888 of 6464 mothers) who did not share beds (P < .0001). However, this difference was not significant at 6 to 8 months (17% vs 15%; P = .17) and was significant in the opposite direction at 17 to 20 months (11% vs 16%; P < .0001). This discrepancy in maternal education persisted for later time points, and the overall pattern was also observed for other socioeconomic markers. Although significant proportions of mothers reported sharing beds regularly at each age, the cross-sectional data suggested that the characteristics of the groups changed over time.

The best-fitting model, as determined by using latent class analysis, is shown in Fig 2. This model had the lowest value of the Bayesian information criterion, had reasonable entropy (entropy = 0.73), and was the bestfitting model on the basis of the bootstrap likelihood ratio test (P = .34, compared with a 5-class model). Four mutually exclusive infant groups were identified over 5 time periods, broadly described as those who rarely shared beds (nonsharers [66%]), those who mainly shared beds in the first year (early bed sharers [13%]), those who mainly shared beds after the first year (late bed sharers [15%]), and those who shared beds throughout the 4 years (constant bed sharers [6%]).

Table 2 shows the background characteristics associated with the different latent classes. This univariate comparison suggests that a slight excess of male infants shared beds across the different latent classes. Bed sharing was significantly more common among the nonwhite ethnic groups, particularly for the group that shared beds throughout the first 4 years. There were weak but significant associations for larger families and term infants among those who constantly shared beds but not among the other bed-sharing groups. There was no significant association between bed sharing and low birth weight. Confirming the findings from our cross-sectional analysis, there were no significant associations between bed sharing and maternal education or social class among those who constantly shared beds, but there were significant differences between those who shared beds only in infancy (who tended to be less deprived) and those who shared beds later (who tended to be more deprived). This may explain, to some extent, the association with young mothers and those who smoked, which did not seem to be as marked among mothers who shared beds early.

Figure 3 reveals the relationship between breastfeeding duration up to 15 months and the different latent classes. The prevalence of breastfeeding was significantly higher among those who shared beds constantly or shared beds early, compared with those who did not share beds. In the group that shared beds early, the rate of decrease in breastfeeding prevalence accelerated at the age when bed sharing was decreasing. In the group that shared beds later, however, the rate of decrease in breastfeeding prevalence slowed at the age when bed sharing increased, which suggests a 2-way temporal relationship between

Characteristic	Nor	Nonsharers	Ear	Early Bed Sharers		Lat	Later Bed Sharers		Const	Constant Bed Sharers		All Bed
	Proportion, %	Reference Group	Proportion, %	² roportion, OR (95% Cl) %	μ	Proportion, %	Proportion, OR (95% CI) %	Ρ	Proportion, %	Proportion, OR (95% CI) %	Ρ	Proportion, %
Male	50.1	1.00 (reference)	53.7	1.15 (1.01–1.33) .04	.04	54.5	1.19 (1.05–1.35) .005	.005	57.3	1.34 (1.11–1.62) .003	.003	54.7
Nonwhite	2.3	1.00 (reference)	4.7	2.07 (1.45-2.96) <.001	<.001	3.9	1.73 (1.22-2.45)	.002	9.5	4.42 (3.06-6.39) <.001	<.001	5.2
>3 children ^a	4.2	1.00 (reference)	5.4	1.29 (0.79-2.05)	.18	6.1	1.47 (0.80-2.03)	.15	8.8	2.18 (1.54–3.10) .02	.02	6.4
Preterm (≤37 wk)	9.6	1.00 (reference)	8.8	0.92 (0.72-1.17)	.47	10.3	1.09 (0.89-1.34)	.42	6.5	0.66 (0.45-0.96)	.03	9.1
Low birth weight (<2500 g)	3.7	1.00 (reference)	3.1	0.82 (0.56-1.22)	.34	3.9	1.04 (0.75-1.45)	.80	4.3	1.15 (0.72-1.84)	.56	3.7
Maternal social class I or II	41.0	1.00 (reference)	44.8	1.17 (1.00-1.36)	.04	34.8	0.77 (0.67-0.88)	<.001	37.6	0.87 (0.70-1.07)	.18	39.0
Maternal education (degree/level)	16.2	1.00 (reference)	18.8	1.20 (1.00-1.43)	.049	10.5	0.61 (0.50-0.74) <.001	<.001	15.8	0.97 (0.75-1.26)	.84	14.4

<.001

.53 (1.24–1.89)

2.30 (1.78-2.98)

52 68

< 001 <.001

1.20 (1.09-1.32)

٩

OR (95% CI)

d Sharers Combined

046 <.001 <.001

0.87 (0.76-1.00)

0.92 (0.83-1.02) 0.95 (0.80-1.12) 0.98 (0.76-1.26)

03

.35 (1.04–1.74)

.75 (1.39–2.21)

3.9 5.7 1.2 48.6

> <.001 .001 -001

2.47 (1.69-3.61) 0.27 (0.08-0.94) .37 (1.13-1.66)

4.1 7.9 0.5 52.1

.57 <.001

.03 <.001

.86 (1.39-2.47) .27 (1.12-1.44) 0.87 (0.54-1.40)

4.1 6.0 1.7 50.3

39 16 .04

.18 (0.80-1.74)

3.4 4.9 1.0 44.6

.00 (reference) .00 (reference)

2.9 3.4 <u>1</u>.9

Young mother (<21 y)^b

.00 (reference) 00 (reference)

.01 (0.88-1.17) .29 (0.91-1.84) 0.50 (0.26-0.98)

.44 (1.04-2.00)

15

.43 (0.88-2.32)

02

0.63 (0.42-0.94)

.19 (1.08-1.31)

Background Characteristics Potentially Associated With Bed-Sharing Groups in Univariate Analyses **TABLE 2**

44.3 OR indicates odds ratio; CI, confidence interval. Maternal smoking (ever smoked) $^{\rm c}$ ^a Including study subject.

) No significant difference among older mothers (>35 y of age) ⁵ Mothers who smoked or had a history of smoking.

bed sharing and breastfeeding in these groups.

The relationship between bed sharing and breastfeeding was tested in a multivariate logistic regression model with breastfeeding at 12 months as the outcome variable (Table 3). At 12 months, 11% of all infants were still breastfeeding, but proportions differed significantly among the latent classes (9% for nonsharers, 14% for late bed sharers, 19% for early bed sharers, and 34% for the smaller group that shared beds constantly) (Fig 3). Older maternal age, larger families, and higher maternal educational levels remained significant predictors in the model, as did maternal social class when added. For all of the bed-sharing latent classes, the relationship with breastfeeding remained significant after controlling for potential confounders and was twice as strong in the group that shared beds throughout the period, compared with the groups that shared beds early or later. A repeat of the latent class analysis and regression modeling with the larger data set yielded similar results (data not shown).

DISCUSSION

Overall Findings

A longitudinal, population-based analvsis of parent-infant bed-sharing data into early childhood suggested that there were different patterns of bed sharing over time and these distinct groups had different socioeconomic characteristics that would be difficult to identify by using a cross-sectional analysis. All of the bed-sharing groups had some characteristics in common, however, including a slight male preponderance, nonwhite ethnicity, and a strong association with breastfeeding duration.

Multiple birth No partner

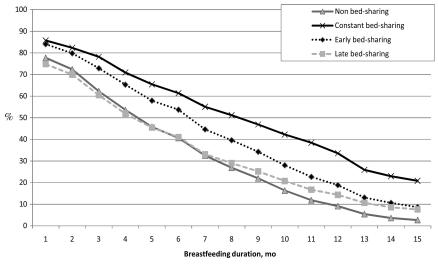


FIGURE 3

Breastfeeding duration over the first 15 months among the latent class groups. The highest prevalence of breastfeeding at all time points was among those who shared beds constantly, followed by those who shared beds mainly in infancy. The prevalence of breastfeeding for the group that shared beds later in childhood was initially the lowest of all groups but improved and overtook the rate for the non-bed-sharing group after 6 months.

TABLE 3 Multivariate Logistic Regression Model of Breastfeeding at 12 Months

Variable	Multivariate Odds Ratio	Р
	(95% Confidence Interval)	
Bed sharing (latent class)		
Late	1.69 (1.35-2.10)	<.001
Early	2.33 (1.87-2.89)	<.001
Constant	5.21 (4.06-6.68)	<.001
Maternal education (degree/level)	2.88 (2.40-3.45)	<.001
>3 childrenª	1.86 (1.37-2.52)	<.001
Maternal age		
>35 y	2.32 (1.83–2.93)	<.001
<21 y	0.50 (0.24-1.06)	.07
Multiple birth (twins)	0.44 (0.17-1.12)	.09
Nonwhite	1.18 (0.79–1.76)	.42
Low birth weight (<2500 g)	0.81 (0.48-1.39)	.45
Gestational age of \leq 37 wk	0.90 (0.66-1.22)	.50
Male	0.96 (0.82-1.13)	.65
No partner	1.00 (0.65–1.55)	.99

The multivariate logistic regression model included 6826 (91.7%) of 7447 subjects with data for all 5 time points. One variable (maternal social class I or II) had >5% missing values; when added to the model, this was significant (odds ratio: 1.67 [95% confidence interval: 1.37-2.02]; P < .001).

^a Including study subject.

Strengths and Limitations

One of the advantages of latent class analysis is that the groups can be determined through the modeling process, rather than being forced into predefined categories. Patterns that would not be evident in a crosssectional approach can be observed, which gives us better insight into grouped behavior. Other strengths are the size of this study and its generalizability, because it is population based. Limitations include the necessary trade-off between having a larger number of observational time points (which allows a potentially larger number of latent classes) and the inevitable effect in a longitudinal study that, when more time points are used (ie, longer periods of data collection), fewer subjects provide data at all time points. In almost all longitudinal studies, drop-out rates are highest for the socioeconomically most-deprived groups; therefore, use of larger numbers of time points may involve the risk of skewing the data toward lessdeprived groups. However, the Avon Longitudinal Study of Parents and Children was of sufficient size that, although some of the individuals of the vulnerable groups were lost through this attrition, enough families remained in the study for differentiation between even relatively small social groupings. To test the validity of the groups identified in the subset of 7447 individuals with data for all 5 time points, the analysis was repeated by using the larger data set with more gaps in the data at each time point; the patterns of the latent classes were similar in shape and size, and the 3 bed-sharing groups all remained significant predictors of breastfeeding at 12 months in the regression model.

To attempt to understand and to interpret the potential characteristics associated with bed sharing, we opted to dichotomize the variables, although there might be some loss of sensitivity in categorizing the data in this way. Our use of data on "usual" bed-sharing practices means that information on intraindividual variations in practice on different nights of the week or at different times of the night cannot be examined, and these variations may account in part for the relatively low entropy levels in the latent class models. Similarly, we collected data on breastfeeding duration but did not take into account exclusivity or other modes of feeding.

Characteristics of Bed Sharing

Approximately one-third of English parents share beds with their infants or children on a regular basis, some just during the infancy period, some when the child is somewhat older, and \sim 6% from birth until the child reaches school age. Previous findings that bed sharing is significantly more common among nonwhite communities in the United Kingdom²⁷ and is more common among boys¹ are confirmed and extended, in that these characteristics apply regardless of the age of the child. Similarly, bed sharing is slightly more common among larger families, younger mothers, and single mothers. Bed-sharing during the early months also is less common among families with preterm or low birth weight infants, twins, or triplets.

Bed Sharing and Social Patterning

Previously, we have demonstrated that infant bed sharing is a relatively common practice in England and is not related to social class.¹ However, the cross-sectional approach used previously obscured significant differences in how families share beds over time that were identified by using a longitudinal approach. Compared with mothers who did not share beds routinely, mothers who shared beds predominantly during infancy were slightly better educated and less deprived. The opposite was true of mothers who shared beds after the infancy period, although we do not know the extent to which this was the choice of the parent or the increasingly mobile child. Mothers who did not share bed routinely at any time in the first 4 years were not significantly different with respect to socioeconomic or educational characteristics from the mothers who shared beds consistently, although a significantly larger proportion of smokers was found in the latter group.

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Bed Sharing and Breastfeeding

In investigations of the relationship between breastfeeding and bed sharing, it is difficult to be precise about the dominant direction of the relationship. that is, do mothers share beds because they are breastfeeding or does bed sharing make breastfeeding more likely to be successful? A review of bed sharing and breastfeeding by Buswell and Spatz²⁸ found a positive correlation between these care practices in 8 of 11 studies, although the findings from those studies were based on cross-sectional data. In our longitudinal analysis, the changes in breastfeeding prevalence around the times of changes in bed-sharing practices, as shown in Fig 3, suggest the potential for a 2-way, complex, interdependent, temporal relationship. This finding by itself is insufficient to distinguish the independent role of bed sharing in breastfeeding, but perhaps additional clarity can be gained by using a qualitative approach.

CONCLUSIONS

The potential risk associated with bed sharing and sudden infant deaths has led many professionals to recommend parents never to take their infants into bed with them. As we reported previously,⁷ this might lead some parents to adopt more-hazardous nighttime infant care practices, such as sleeping on a sofa. In the present study, we showed that the socioeconomic and educational characteristics of families that are most likely to share beds in the first few months after an infant's birth place them at very low risk of SIDS; therefore, any benefit from preventing bed sharing in this group is likely to be very small. Such families also are most likely to follow professional advice regarding infant care practices and therefore may suffer the adverse consequences of lesssuccessful or shorter breastfeeding if they choose not to share beds. The more socioeconomically deprived families in the United Kingdom, for which the risk of sudden infant death is higher, are less likely to share beds or to breastfeed in the first months after birth. Given the likely beneficial effects of bed sharing on breastfeeding rates and duration, risk reduction messages to prevent sudden infant deaths would be targeted more appropriately to unsafe infant care practices such as sleeping on sofas, bed sharing after the use of alcohol or drugs, or bed sharing by parents who smoke.

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