

REGULAR ARTICLE

Swedish survey of infant sleep practices showed increased bed-sharing and positive associations with breastfeeding

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Abstract

Aim: Many countries lack monitoring of infant sleep practices, despite associations with sudden infant death. We studied sleep positions, bed-sharing and breastfeeding in a new birth cohort.

Methods: Data were obtained from a prospective, population-based cohort study of children born in western Sweden in 2018. The parents of 9,465 six-month-old infants, via postal questionnaires, were asked about their infants' sleeping positions at three and six months, including where they slept and any bed-sharing arrangements. The data were compared with our earlier 2003–2004 birth cohort.

Results: Questionnaires were completed by the parents of 3,590 (38%) infants. At three months, 54% of the infants slept in a separate cot in their parents' room. A further 43% slept in their parents' bed: 42% in baby nests and 42% in close contact with their parents. At six months, 33% bed-shared, compared with 20% in 2003–2004 ($p < 0.001$). Bed-sharing was positively associated with breastfeeding (odds ratio at three months: 1.5–2.8, 95% confidence interval: 1.1–4.5).

Conclusion: Most infants slept in separate cots during the first three months. However, bed-sharing showed an increasing trend and baby nests were popular. Bed-sharing was positively associated with breastfeeding, but the association may not be causal.

KEYWORDS

baby nest, bed-sharing, breastfeeding, infant sleeping position, sudden infant death syndrome

1 | INTRODUCTION

The position that infants sleep in has been of great interest to child health professionals ever since prone sleeping was recognised as a risk factor for sudden infant death syndrome (SIDS).¹ Despite that, many countries, including Sweden, do not regularly monitor infant care practices, such as where the infant sleeps and what position they are placed in.

Bed-sharing has been noted as a risk factor for sudden infant death since ancient times, and in the New Zealand Cot Death study, bed-sharing was clearly demonstrated to significantly raise the risk of SIDS, particularly among infants of mothers who smoke.² In the last 10–15 years, bed-sharing as a risk factor for sudden unexplained death in infancy has received renewed attention.^{3–5} There is consensus that bed-sharing should not be practised if parents drink alcohol, take drugs or smoke cigarettes. However, it is discussed whether there is a risk for breastfed term infants of non-smoking parents to bed-share.⁶

Abbreviations: CI, confidence interval; OR, odds ratio; SIDS, sudden infant death syndrome.

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The current official Swedish advice is that the safest place for an infant to sleep during the first few months of life is in a cot of its own.⁷ However, the country's healthcare authorities are aware that many parents want their infant to sleep with them in their bed. One reason for this is to facilitate breastfeeding. Therefore, the advice in Sweden has been that parents should create a special space for the infant in their bed, if this is the approach that they want to adopt.⁸ This has led to an interest in so-called baby nests that aim to provide infants with their own safe sleeping space. These are basically portable mattresses, with padded sides, that offer a narrow and cosy sleeping area for infants.

Our aim was to study a new birth cohort so that we could identify infant care practices with regard to the position they slept in, where they slept and what bedding arrangements were used if they slept in the same bed as their parents. We also wanted to compare the prevalence of bed-sharing with previous data that we collected in 2003–2004⁹ and how various modes of bed-sharing were associated with breastfeeding. From trends we believe we see among young parents and when working at child healthcare centres, our hypotheses were that bed-sharing would have increased in Sweden since our 2003–2004 birth cohort study⁹ and that most infants would now sleep in their parents' bed. Furthermore, we supposed that bed-sharing would be positively associated with breastfeeding.

2 | METHODS

2.1 | Cohort

Data were obtained from a new prospective, longitudinal and population-based cohort study of children born in western Sweden in 2018.

Unbound random samples were drawn from the Swedish population register which is the Swedish government's register including all people, citizens and non-citizens, permanently living in Sweden. Half of the birth cohort in the county of Västra Götaland, that is the Western Sweden region, was randomly selected from the register. This ensured that we approached a representative sample of all births in the region during the study period. The register is updated daily, which makes it implausible for parents to deceased infants to be contacted. The total sample included 9,799 infants born in 2018, of which 9,465 families could be reached and invited to participate.

The postal questionnaires were answered when the child was six months of age. The parents were asked about the infant's sleeping position, where they slept and the bedding arrangements used for the infant at three and six months of age.

The data from a similar study that we performed in 2003–2004⁹ were available for comparison purposes.

2.2 | Sleeping position

The parents were asked how they usually placed their infant when they went to sleep at three months of age. The possible responses

Key Notes

- This questionnaire-based study explored the sleep positions, bed-sharing and breastfeeding of 3,590 Swedish infants at three and six months of age.
- At three months, 43% slept in their parents' bed, where baby nests were popular, and bed-sharing showed an increasing trend.
- Bed-sharing was positively associated with breastfeeding, although the direction of the effect cannot be determined.

were as follows: on their back, on their stomach, on their side, alternately on their back or side, alternately on their back or stomach or alternately on their stomach or side. They could also answer in some other ways and, if they did so, they were asked to provide details. The parents were asked the same question about how they place their six-month-old infant, and the possible responses were the same. They were also asked what position their infant was usually in when they woke up at 6 months of age, using the same possible responses.

If the parents answered that they alternately used the side or supine positions, the answers were counted as any side sleeping. If the parents answered that they alternately used the side or prone positions, the answers were counted as any prone sleeping. We did this so that we could monitor the sleeping positions associated with increased risk of SIDS.

2.3 | Sleeping place

The parents were asked where the infant slept during the night at three and six months. The possible responses were as follows: in its own bedroom, in another room than the parents' bedroom but not own room, in its own cot in the parents' bedroom or in the parents' bed.

2.4 | Bedding arrangement in the parents' bed

The parents were also asked about the bedding arrangements at three and 6 months of age. If the infants slept in the parents' bed, the parents were asked about the arrangements: in a baby nest, in a free, own area in the parents' bed, but not in a baby nest, or in close contact with parent.

A baby nest is a textile, bassinet-like device with upholstered frame. The shape is rectangular with rounded corners or oval. The baby nest is usually placed in the parental bed but could be placed in a separate cot or crib.

2.5 | Statistical methods

The proportions were compared using the chi-square test (Epi Info; CDC, USA), and the results were considered significant if the *p* value was <0.05. Multinomial logistic regression is an extension of binary logistic regression, where the outcome/dependent variable can take more than two values. This was performed to simultaneously estimate the association between breastfeeding ever, parental education, maternal smoking during pregnancy and dummy at bedtime as covariates/independent variables, and the different bedding environments contained in an outcome variable with four strata: not bed-sharing, baby nest, free own area and close contact. The reference category was not bed-sharing. The risks were estimated with odds ratios (OR) and 95% confidence intervals (CIs). The chi-square for trend was used to calculate the linear-by-linear association (Epi Info; CDC, USA). The other calculations were carried out with SPSS, version 26 (IBM Corp, New York, USA). The responses to the individual questions were high, ranging from 98.9% to 99.7%, as noted in the headings and legends of the relevant tables and figures. The data are presented as rounded percentages in the text and to one decimal place in the Tables.

3 | RESULTS

3.1 | Participants

Questionnaires were returned from the parents of 3,590/9,465 (38%) infants, boys 51.8%, who also provided written, informed consent and entered the study.

3.2 | Sleeping position

More than 60% of the infants were placed in the supine position at night when they were three months of age. When we included those, who were alternately placed supine or on their side, this percentage increased to almost 85%. The side position was used for 8% of the infants, and this rose to 32% when those who were alternately placed on their side or supine were included. The prone position was used for almost 6%, and this was usually alternated with the side or supine position (Figure 1, Table 1).

At six months of age, the use of the supine position had decreased from 60% to 40%, while the side, and supine or side position had increased from 8% to 45%. Any use of the prone position, which has been associated with the greatest risk of SIDS, had increased from 6% to 11% (Figure 1, Table 1). At six months of age, 18% ($p < 0.001$) were found in the prone position when the parents woke up in the morning and this rose to 36% when we also included those who were sometimes found prone, on their side or supine (Table S1). Fewer six-month-old infants were found supine or on their side than the number who had been put down to sleep in these positions (Table S1).

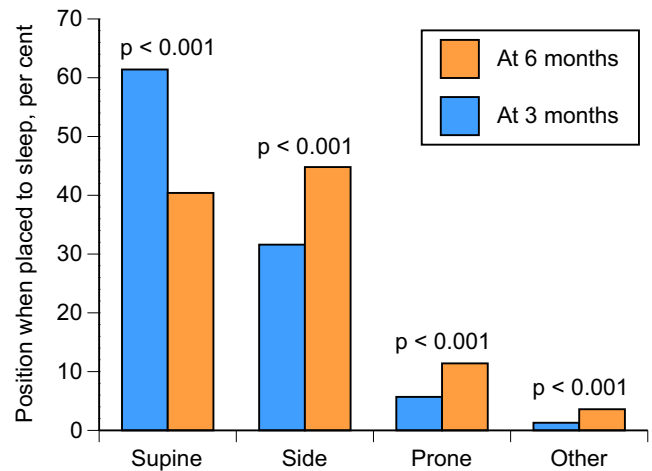


FIGURE 1 The position the infants were usually placed in when they were put down to sleep at three and six months of age. Side relates to the combination of side only and alternative use of the side or supine position, while prone relates to the combination of prone only and alternative use of the side or prone, or supine or prone, position. The figure is based on 3,566 (99.3%) responses for three months and 3,579 (99.7%) responses for six months.

TABLE 1 Positions that the infants were laid to sleep in at three and six months, based on 3,566 (99.3%) responses for three months and 3,579 (99.7%) responses for six months.

Position	Laid to sleep at three months		Laid to sleep at six months		<i>p</i>
	<i>n</i>	%	<i>n</i>	%	
Supine	2,191	61.4	1,446	40.4	<0.001
Prone	83	2.3	124	3.5	0.002
Side	300	8.4	503	14.1	<0.001
Supine/side	826	23.2	1,097	30.7	<0.001
Supine/prone	54	1.5	125	3.5	<0.001
Prone/side	66	1.9	156	4.4	<0.001
Other	46	1.3	128	3.6	<0.001
Total	3,566	100	3,579	100	

3.3 | Sleeping place

At three months of age, 54% of the infants slept in its own cot in their parents' bedroom, while 43% slept in their parents' beds (Figure 2, Table S2). At six months of age, the percentage who slept in their parents' bed had decreased to 33%, while those who slept in its own cot were still just over 50% (Figure 2, Table S2).

3.4 | Arrangements in the parents' bed

An equal percentage (42%) of those who slept in their parents' bed slept in a baby nest or in close contact with their parent at three

months (Figure 3, Table S3). A further 15% of the parents said that they tried to provide the infant with their free, own area in the parents' bed, but did not use a baby nest. At six months, less than 10% of the infants slept in a baby nest, 50% slept in close contact with their parents and 40% had their own free space in their parents' bed (Figure 3, Table S3).

3.5 | Bed-sharing

When we compared the latest study results at six months with the findings of our previous birth cohort, we found that bed-sharing had shown a statistically significant rise, from 20% (1074/5422) in the 2003–2004 survey⁹ to now 33% in 2018 ($p < 0.001$).

The multinomial regression analysis found that several bed-sharing factors were associated with significantly increased odds ratios for breastfeeding when the infants that did and did not share their parents' bed were compared (Table 2). These were bed-sharing using a baby nest, creating a free space for the infant and close contact between the infant and parent.

When the different bed-sharing arrangements, that is baby nest, free space and close contact, were hypothesised to represent an increasing amount of proximity between the infant and the mother, there was a statistically significant linear-by-linear association (chi-square for trend $p < 0.001$), where the closer proximity was associated with an increased tendency to breastfeed. The association between breastfeeding and bed-sharing was significant at both three and six months for free space and close contact, but not at six months when a baby nest was used.

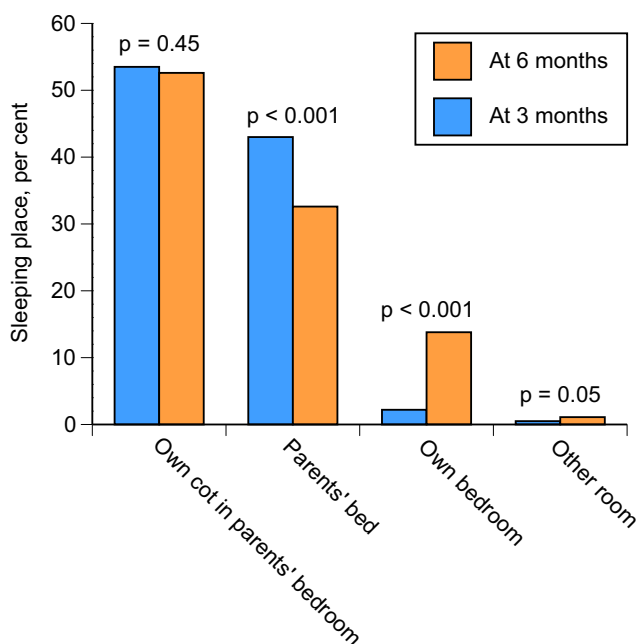


FIGURE 2 Place where the infant usually slept during the night at three and six months of age. The figure is based on 3,564 (99.3%) responses for three months and 3,577 (99.6%) responses for six months.

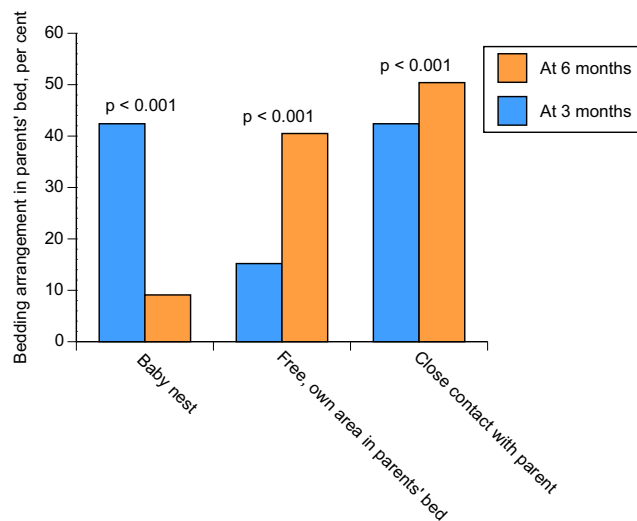


FIGURE 3 Bedding arrangement for the infants who slept in the parents' bed at three and six months of age. The figure is based on 3,564 (99.3%) responses for three months and 3,577 (99.6%) responses for six months.

There was a negative association between use of dummy at bedtime and bed-sharing, which was significant at both three and six months for free space and close contact, but not at six months when a baby nest was used (Table 2). No trends were found between sleeping arrangement and either parental education or maternal smoking.

The proportion of mothers who both bed-shared and smoked was 0.8% at three months and 0.6% at six months. This can be compared with results from the 2003 cohort, where the proportion at six months was 1.2% at six months. Data from three months were not available in that cohort.

3.6 | Dummies, sleeping bags and swaddling

Using a dummy when the infant was going to sleep was common at both three and six months and showed a slight increase with age (60% versus 63%, $p = 0.02$) (Table S4). In contrast, few parents reported using a sleeping bag for the infant: 6% at three months and 4% at six months (Table S5). Swaddling was also uncommon at three months of age (6%) (Table S6).

4 | DISCUSSION

The major findings of this study were that most three-month-old infants slept in a separate bed in their parents' bedroom and only 43% slept in their parents' bed. Of those who slept in their parents' bed, 42% slept in a baby nest and 42% in close contact with their parent, while 15% of the parents tried to create a separate space for their infant without using a baby nest. Bed-sharing, which creates closer proximity between infants and mothers, was associated with an increased tendency to breastfeed. Furthermore, when bed-sharing,

TABLE 2 Multinomial regression analysis of association between the covariates/independent variables breastfeeding ever, maternal and paternal education, maternal smoking during pregnancy and use of dummy at bedtime and the response/dependent variable sleeping arrangements at three and six months. The dependent variable had four strata: not bed-sharing (reference), baby nest, free own area in parents' bed and close contact with parent. Bold odds ratios (OR) and 95% confidence intervals (CI) indicate statistical significance.

	Not bed-sharing		Baby nest		Free area		Close contact	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
At three months								
Infant ever breastfed	1.0	Ref.	1.5	1.1-2.2	2.1	1.1-4.1	2.8	1.7-4.5
Maternal education <12 years	1.0	Ref.	1.0	0.6-1.6	0.7	0.3-1.4	1.2	0.8-1.9
Paternal education <12 years	1.0	Ref.	1.0	0.7-1.5	1.4	0.8-2.3	0.9	0.6-1.3
Maternal smoking during pregnancy	1.0	Ref.	0.8	0.4-1.4	1.2	0.5-2.6	0.9	0.5-1.7
Dummy at bedtime	1.0	Ref.	0.8	0.7-0.99	0.4	0.3-0.5	0.3	0.3-0.4
At six months								
Infant ever breastfed	1.0	Ref.	1.1	0.6-2.2	2.0	1.2-3.2	3.8	2.1-6.7
Maternal education <12 years	1.0	Ref.	2.3	1.1-4.8	0.7	0.4-1.3	1.3	0.9-2.1
Paternal education <12 years	1.0	Ref.	1.3	0.6-2.6	0.9	0.6-1.4	0.9	0.6-1.4
Maternal smoking during pregnancy	1.0	Ref.	0.6	0.1-2.4	0.9	0.5-1.8	0.6	0.3-1.3
Dummy at bedtime	1.0	Ref.	1.2	0.8-1.8	0.5	0.4-0.6	0.4	0.3-0.5

a closer proximity was associated with an increased tendency to breastfeed. In this study, bed-sharing at age six months showed a statistically significant rise compared with our previous birth cohort study in 2003-2004.

Our hypothesis that the majority of infants would sleep in the parents' beds was not confirmed. Just over half (54%) slept in a separate cot in their parents' bedroom at three months, and this was similar (53%) by six months. However, our hypothesis that bed-sharing would have increased since our last study was correct, as 33% bed-shared at six months in 2018 versus 20% in the 2003-2004 cohort,⁹ which was a significantly increased proportion. Shared sleeping was not explored by our 2003-2004 study at three months of age. This was in line with what has been reported from the USA. Unlike Sweden, the USA have had a monitoring of infant care practices since the 1990 s. Between 1993 and 2010, bed-sharing increased from 6.5% to 13.5% for infants seven months or younger, although there were large differences between ethnic groups with higher percentages for black infants than for Hispanic and white.¹⁰ Our hypothesis that bed-sharing would be positively associated with breastfeeding was also verified. However, we cannot distinguish the direction of the effect. The decrease in bed-sharing between three and six months, from 43% to 33%, was in line with other results.¹¹

As we expected, the use of the supine sleeping position decreased between three and six months, while the side and prone positions increased. We saw a similar pattern in a study from 2012 to 2014.¹¹ At six months, many infants are able to roll over and this was illustrated in our study by the observation that more than one-third of the infants who were placed supine or on their side were usually, or sometimes, found in the prone position the next morning.

Alternatively placing infants in the supine or side sleeping position has become more common over the last two decades. At the same time, there has been a decreasing trend in the use of the supine sleeping position. The reason why many parents choose to place infants on their sides is not known. The national advice is to place the baby on the back. This advice was reinforced five years ago.⁷ It could be that some parents feel that the baby sleeps better on the side, just as we know that some parents feel that the baby sleeps better on the stomach. We know that before prone sleeping became the rule in the early 1970 s, side sleeping was often used in our country as an alternative to supine sleeping.

From New Zealand, Abel and Tipene-Leach¹² and Mitchell et al¹³ have reported on the successful use of the so-called wahakura and pēpi-pod. The wahakura was developed in 2006 to prevent deaths while bed-sharing.^{12,13} The wahakura is a woven flax bassinet with a thin, firm mattress, while the pēpi-pod is a similar bassinet but made from another material, for example plastic.¹² The wahakura, or pēpi-pod, can be placed in, or at the side of, the parents' bed to avoid accidental suffocation. Accidental suffocation is probably an underestimated cause of sudden unexplained death in infancy, especially when investigation of the death scene is not performed.^{14,15}

However, to the best of our knowledge, data on the use of baby nests have not previously been published. At three months of age, 42% of the infants who slept in their parents' bed in our study, namely 20% of the cohort, were placed in a baby nest. This was just as common as having the infant in close contact with the body, which also scored 42%. The baby nests were most popular during the first three months and only 9% of bed sharers, or 3% of the whole cohort, used them at six months.

When using a baby nest, it is important to be aware of potential hazards. The Swedish Consumer Agency emphasises that the sides and bottom should not be too soft or fluffy.¹⁶ Fluffy sides could allow the baby to embed its face and endanger free air flow. Similarly, an older baby which can roll over should not be able to get its face wedged in the angle between a fluffy bottom and side. We do not know, however, of fatal accidents with unsafe baby nests in our country.

An important reason for bed-sharing is the mother's intention to breastfeed her baby.⁴⁻⁶ That was reinforced in our study by the fact that we found significantly increased odds ratios for bed-sharing with ever breastfed infants at three and six months. At three months, this was true for all three of the bed-sharing options surveyed: close contact, creating a free space for the infant and bed-sharing using a baby nest (at six months the odds ratio for baby nest was not significant). However, close contact between the mothers and infants was associated with a higher tendency to breastfeed than the other two bed-sharing modes.

We are aware that bed-sharing cannot be described simply as dichotomic. Bed-sharing varies from night to night and even within the night. Also, bed-sharing can be temporarily used when the infant is ill. It is possible that this ambiguity might lead to misclassification. What we capture are the usual habits. Furthermore, it is important to recognise that this, and similar studies, cannot determine the direction of the association reported, that is whether bed-sharing leads to breastfeeding, or breast-feeding leads to bed-sharing.

In contrast, there was a negative association between use of dummy at bedtime and bed-sharing, although the analysis does not show the direction of the association. It could be speculated whether parents who bed-share are negative to dummies or whether bed-sharing reduces the need to comfort the baby with a dummy. Level of education showed no association with bed-sharing, except for a minor association between low maternal education and using a baby nest at six months.

A study published by our research team in 2017 reported that maternal smoking during pregnancy was associated with a lower prevalence of bed-sharing.¹¹ At the time, we thought that this could have been due to a highly publicised study, published some four years earlier, that raised awareness that smoking increased the risk of SIDS during bed-sharing.⁴ Our current study did not observe any effects of maternal smoking during pregnancy on the likelihood of bed-sharing at three or six months, given the increased risk of SIDS with bed-sharing in smoking mothers that combination is a concern.²⁻⁴ However, the proportion of mothers who both bed-shared and smoked was very low, below 1% at three and six months, and probably not increasing over time.

Giving the infant a dummy when they are going to sleep has been reported to reduce the risk of SIDS,¹⁷ and use of a dummy was common in our study at three and six months. Sleeping bags can prevent infants from moving under the quilt and rolling over from the supine to prone position. However, only 6% and 4% of our parents used them at three and six months, respectively. The use of swaddling

has been shown to increase the risk of SIDS¹⁸ and is discouraged in current Swedish infant care practice.⁷ Only 6% of our parents used this when their infants were three months of age.

4.1 | Strengths and limitations

The strengths of this study were the large number of infants, almost 3,600, in the study cohort and the fact that we asked detailed questions about the infants' sleeping habits at both three and six months. In addition, the responses to the individual questions were high, ranging from 98.9% to 99.7%.

A limitation was that only 38% of the families that were invited entered the study and answered the questions. Low response rate is a problem in common with many postal surveys. We know from a similar study that we carried out that participants tend to be somewhat better educated than non-participants.¹⁹ A comparison with official data showed that 2.8% of the mothers in our study had smoked during pregnancy compared with 5.4% in the county of Västra Götaland. The figures for ever breastfeeding at six months were 92.4% in our study vs 95% in the region. This would indicate that the differences from the general population were small. Official statistics for dummy use or for education in the relevant age stratum was not available.

Finally, we did not ask respondents about their ethnic background and we recognise that cultural practices may vary, both within Sweden and between different countries. That would be an interesting area for future research.

5 | CONCLUSION

This study showed that more than half of the infants slept in a separate bed in their parents' bedroom at three months of age, while 43% slept in their parents' bed. Although bed-sharing had fallen to 33% at six months of age, it was still more common than the 20% recorded by our 2003–2004 study at that age.⁹ There was an association between bed-sharing and breastfeeding and closer contact between the infant and the mother during bed-sharing was associated with an increased tendency to breastfeed, although a causal relationship cannot be established.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

ETHICAL APPROVAL

The study was approved by the Central Ethical Review Board in Gothenburg.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

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