

# Improving Infant Sleep Safety Through a Comprehensive Hospital-Based Program

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## Abstract

We evaluated a comprehensive hospital-based infant safe sleep education program on parental education and safe sleep behaviors in the home using a cross-sectional survey of new parents at hospital discharge (HD) and 4-month follow-up (F/U). Knowledge and practices of infant safe sleep were compared to the National Infant Sleep Position Study benchmark. There were 1092 HD and 490 F/U surveys. Supine sleep knowledge was 99.8% at HD; 94.8% of families planned to always use this position. At F/U, 97.3% retained supine knowledge, and 84.9% maintained this position exclusively ( $P < .01$ ). Knowledge of crib as safest surface was 99.8% at HD and 99.5% F/U. Use in the parents' room fell to 91.9% (HD) and 68.2% (F/U). Compared to the National Infant Sleep Position Study, the F/U group was more likely to use supine positioning and a bassinet or crib. Reinforcing the infant sleep safety message through intensive hospital-based education improves parental compliance with sudden infant death syndrome risk reduction guidelines.

## Keywords

sudden infant death syndrome, sudden unexpected infant death, infant sleep safety, public education, patient safety

The Back to Sleep Campaign was responsible for a 53% reduction in sudden infant death syndrome (SIDS) in the 1990s.<sup>1</sup> Despite this success, there has been no further decrease in death rates in the past decade, and SIDS remains the leading cause of postneonatal infant mortality. Additionally, accidental suffocation deaths have risen dramatically in the past decade and have become the major cause of preventable deaths in infants <12 months of age.<sup>1,2</sup> The American Academy of Pediatrics Task Force on SIDS continues to periodically update evidence-based recommendations to reduce the risk of SIDS and other sleep-related deaths by creating the safest sleep environment possible for infants. However, the safe sleep message has become more complex, and families are not following the recommendations consistently. The National Infant Sleep Position Study (NISP) revealed that 25% of parents do not consistently keep their infants in the supine position for sleep. In addition, the survey demonstrated an increase in bed sharing—another independent risk factor for SIDS and one not recommended by the American Academy of Pediatrics.<sup>3–6</sup>

The birth of an infant offers a unique opportunity for a teachable moment to promote change in parental behavior. The NEWS Study found parents agreeable to

enrolling in a smoking cessation program in the immediate postpartum period, and this seemed to stimulate quit attempts.<sup>7</sup> Consistent and comprehensive education in the hospital setting has also been shown to be an effective technique for promoting safe behaviors in the home setting. Dias et al developed an abusive head trauma prevention bundle of parental education before hospital discharge. The bundle consisted of watching an educational video, reviewing written education materials with staff, and signing a commitment statement. The study demonstrated knowledge retention at 6 months and a decrease in abusive head trauma cases in western New York.<sup>8</sup>

The purpose of this study was to evaluate a comprehensive hospital-based infant sleep safety (ISS) program on parental education and safe sleep behaviors in the home.

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## Methods

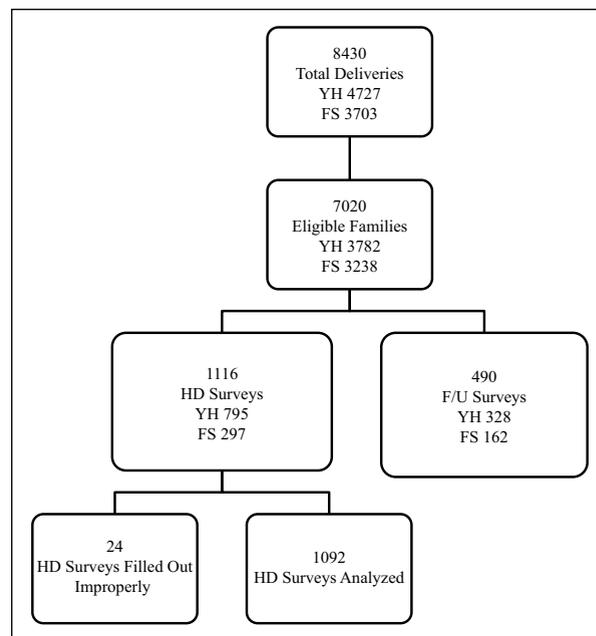
### Design

This study tested the effectiveness of a system-level intervention in 2 postpartum maternity units. We performed a cross-sectional survey of parents of healthy newborns at the time of hospital discharge (HD) and at 4-month well-child care visit (follow-up [F/U]) using a quasi-experimental nonequivalent control group design. Participants were recruited in the hospital by maternity nursing staff. Parents were asked to submit a F/U survey administered by office staff of their child's primary care provider. The study took place in 2 community hospital nurseries in south-central Pennsylvania and suburban Baltimore, Maryland. The institutional review boards of both WellSpan York Hospital and MedStar Health Research Institute approved this study.

Consent was obtained for the questionnaire on ISS after families completed the education program but before hospital discharge. Consent was also obtained for the F/U questionnaire at the 4-month well-child care visit. Data were obtained from August 2010 to March 2012. Information obtained included (1) knowledge about sleep location, sleep position, crib environment, room temperature, pacifiers; (2) behaviors regarding use of crib, supine position, no soft bedding or bumpers, comfortable room temperature, use of pacifier, no prevention devices, feedings; (3) education information, including sources of education and usefulness of ISS program; and (4) demographic information (Appendix A). Because the survey questions were designed to be comparable in content to the NISP,<sup>9</sup> we obtained its most recent data (2010) for comparison (raw data obtained from NISP by D. Rybin, personal communication, September 24, 2012). Use of a control group was rejected because it was deemed unethical to withhold potentially lifesaving information from families and because preventing the control group's cross contamination (ie, from receiving any safe sleep information) was too high a burden. Statistical analysis was performed with SPSS 19 (Armonk, New York). Data were analyzed by chi-square and *z* test of proportions.

### Intervention

In 2008, 2 community hospitals with a delivery base of 6000 independently developed and implemented comparable comprehensive ISS programs. Program components included consistent modeling of safe sleep behaviors by all staff, viewing of the educational DVD *Safe Sleep for Your Baby: Right From the Start*,<sup>10</sup> nurse education with review of written materials on



**Figure 1.** Flow diagram of survey respondents. FS, MedStar Franklin Square Medical Center; F/U, follow-up; HD, hospital discharge; YH, WellSpan York Hospital.

ISS, and parental signature of an acknowledgment form (Appendix B). The only variation between the 2 sites was mandatory viewing of the DVD (WellSpan York Hospital) versus voluntary viewing (MedStar Health Research Institute). Both institutions prioritized a culture of ISS and injury prevention, with all nursery staff receiving standardized education and displaying maintenance of ISS competency. At every interaction, staff makes sure that each family is counseled on ISS and that each baby has a safe place to sleep at home. All healthy infants are maintained in an appropriate safe sleep environment in the hospital as recommended by the American Academy of Pediatrics (supine positioning, firm mattress, no soft or loose bedding, no bed sharing, appropriate pacifier use).

## Results

During the study period, a total of 8430 babies were born between the 2 hospitals (WellSpan York Hospital,  $n = 4727$ ; MedStar Health Research Institute,  $n = 3703$ ; of which 7020 were eligible for study participation Figure 1). At the time of hospital discharge, 1116 surveys were completed, with 1092 that were complete and analyzable. The 4-month F/U group consisted of 490 completed surveys from families of infants born at the intervention hospitals. The mean infant age at F/U was  $17.3 \pm 1.6$  weeks. The 2010 NISP comparison group

**Table 1.** Demographic Description of the Hospital Discharge and Follow-up Samples (in Percentages).

	Discharge (n = 1092)	Follow-up (n = 490)	P Value
Parental age, y <sup>a</sup>	27.6 ± 5.9	28.7 ± 5.9	.001
Infant sex (male)	51.1	55.6	.106
Respondent			
Mother	85.1	92.9	<.001
Father	14.6	6.4	
Grandparent	0.3	0.6	
Race			
Caucasian	79.2	87.6	.002
African American	10.7	7.1	
Hispanic	6	2.3	
Education			
High school or less	44	38	.027
Greater than high school	56	62	
Insurance			
HMO	20.7	19.5	.002
Medical Assistance	45	37.3	
Private	33	42.6	
Parity			
Primigravida	41.1	45.4	.117
Multigravida	58.9	54.6	

<sup>a</sup>Mean ± SD.

**Table 2.** Demographic Comparison Between the ISS Program and NISP Study Populations.<sup>a</sup>

	ISS (n = 490)	NISP (n = 1046)	P Value
Parental age, y	28.7 ± 5.9	31.3 ± 7.6	<.001
Infant age, wk	17.3 ± 1.6	17.9 ± 6.7	.06
Infant sex (male)	55.6	50	.06
Survey completed by			
Mother	92.9	84.9	<.001
Father	6.4	12	
Grandparent	0.6	2.6	
Race			
Caucasian	87.6	77.9	<.001
African American	7.1	8.7	
Hispanic	2.3	7.4	
Education			
High school or less	38	25.5	<.001
Greater than high school	62	74.5	
Parity			
Primigravida	45.4	38.8	.02
Multigravida	54.6	61	

Abbreviations: ISS, infant sleep safety; NISP, National Infant Sleep Position.

<sup>a</sup>Values in percentages or mean ± SD.

consisted of 1046 surveys of families contacted at a mean of 17.9 ± 6.7 weeks after delivery. The demographic description of the final study population is shown in Table 1 and the comparison with NISP in Table 2.

### *Hospital Discharge Versus F/U*

Compared to HD, parents in the F/U group were slightly older and more likely to be Caucasian with a higher

**Table 3.** Knowledge, Intention, and Actual Safe Sleep Practices at Discharge and Follow-up (in Percentages).

Question	Discharge (n = 1092)	Follow-up (n = 490)	P Value
<b>Knowledge questions</b>			
Safest to sleep on the back	99.8	97.3	<.001
Safest to sleep in the crib in parent's room	91.9	68.2	<.001
Safest to sleep in the crib, any place	99.8	99.5	.61
Room temperature comfortable for adult	85.6	97.9	<.001
Pacifiers protect against SIDS	57.2	65.5	.002
No soft objects in the crib	94.7	93.1	.2
<b>Behavior questions</b>			
Baby always sleeps on back	94.8	84.9	< .001
Baby always sleeps in bassinet/crib	94.9	83.4	< .001
Use of appropriate bedding (no quilt, bumper)	N/A	85.9	N/A
We received devices that say they prevent SIDS	20.2	17.1	.16

Abbreviation: SIDS, sudden infant death syndrome.

level of education and private insurance. Parents left the hospital and maintained high levels of knowledge of safe sleep practices, as demonstrated in Table 3. Supine sleep knowledge was 99.8% at HD and 97.3% at F/U, with 94.8% of families planning to always use this position. At 4 months, 84.9% maintained a supine sleep position exclusively ( $P < .01$ ; Table 3). The most common reasons given for not using supine positioning were that the infant changed position spontaneously and that the baby slept poorly when placed supine. Only 12% used a nonsupine position because of concern for choking; 5% used other positioning because their doctor told them to do so.

Knowledge of the crib as safest surface was 99.8% at HD and 99.5% at F/U, but use in the parents' room was lower at 91.9% (HD) and fell to 68.2% (F/U). Overall crib use remained higher, at 83.4% *always* and 95.5% *routine*. Behavior intention and actual practice results are shown in Table 3. At F/U, 83.4% of parents had never slept with their baby, and only 4.5% practiced this regularly. For parents that did report bed sharing, they generally did not do it for the entire night, with a mean duration per night of  $3.4 \pm 2.6$  hours. The most common reason given for bed sharing was for promotion of breast-feeding.

Retention of the recommendation for nothing in the crib was 94.7% HD versus 93.1% F/U but fell to 85.9% in actual practice. Keeping the baby at an appropriate room temperature increased from 85.6% (HD) to 97.9% (F/U). Knowledge of pacifier use being protective against SIDS increased from 57.2% (HD) to 65.5% (F/U;  $P < .01$ ), but only 39.9% regularly gave their baby the pacifier at sleep. Families felt that they received the correct amount of ISS education (97.3%, HD; 89.6%, F/U); 63.9% of families at HD found the combination of

education techniques most effective, while 51.8% agreed at F/U. Parents were most likely to note receiving education from nurses (71.1%, HD; 74.3%, F/U), followed by the DVD (67.3%, HD; 66.2%, F/U). Physician education was noted by 35.1% (HD) and 47.8% (F/U).

### F/U Versus NISP

The F/U and NISP groups were dissimilar in multiple ways, including which family member completed the survey (Table 2). The F/U group was slightly younger ( $28.7 \pm 5.9$  vs  $31.3 \pm 7.6$  years;  $P < .001$ ) and had a larger proportion of Caucasians (87.6% vs 77.9%;  $P < .001$ ) and primigravidas (45.4% vs 38.8%;  $P = .02$ ). The NISP group demonstrated a higher level of education beyond high school (74.5% vs 62%;  $P < .001$ ).

As shown in Table 4, compared to the NISP data, parents delivering at intervention hospitals were significantly more likely to place their infants to sleep on their backs and in bassinets or cribs. Additionally, intervention parents were significantly more likely to report receiving information from a nurse or doctor. The only area where the NISP group scored higher was in pacifier use. To control for the baseline differences in race, age, and parity, subgroup analyses were performed. The data were reanalyzed with only Caucasian respondents from both groups, as well as only primigravida respondents and those with education greater than high school. There were no changes in the significance of the findings in any of the subgroup analyses.

### Discussion

Hospital-based ISS education is feasible and well accepted by parents. At discharge and 4 months, parents

**Table 4.** Actual Sleep Practices: Comparison of ISS Program and NISP Study (in Percentages).<sup>a</sup>

Behavior Questions	ISS (n = 490)	NISP (n = 1046)
Baby routinely place to sleep on back	92.6	73.1
Baby routinely sleeps in bassinet/crib	95.5	84.1
Baby sleeps under a thin sheet	99.2	85.6
Baby ever given a pacifier for sleep	74.1	84
Received ISS information from nurse or doctor	79.4	62.2

Abbreviations: ISS, infant sleep safety; NISP, National Infant Sleep Position.

<sup>a</sup>Every comparison,  $P < .001$ .

demonstrated high levels of knowledge regarding safe sleep practices. At 4 months, >92% of intervention parents placed their infants to sleep on their backs, and 95.5% used a crib or bassinette. These rates are substantially higher than the NISP data and recently published findings from Colson et al that demonstrated 9% of parents bedshare.<sup>11</sup> Our findings are consistent with other studies that have used intensive education to improve ISS knowledge and intentions to use safe sleep strategies. Srivatsa et al used a nursery-based education program in a predominantly Hispanic population to reduce prone positioning for sleep from 27% to 15%.<sup>12</sup> Moon et al provided education to small groups of families enrolled in the Women, Infants, and Children Program. The intent to use supine positioning increased from 58% to 85%, and 6 months later the intervention group was more likely to position their babies properly (75%).<sup>13</sup>

In addition to knowledge, intention to follow safe sleep practices and use of actual safe sleep practices were higher in parents receiving ISS education over reported national benchmarks. These data are consistent with those of Mason et al, who used a similar bundled intervention. They were able to show a 95% rate of parental intention to use the supine position for infant sleep, and in no case did parents intend to bedshare.<sup>14</sup> Colson and Joslin also reported an increased use of supine positioning, from 42% to 75%, through nursing education and modeling.<sup>15</sup> Improved knowledge and sleep practices are key first steps toward behavior change that can lead to reducing sleep-related deaths.

While the study did not evaluate specifically which factors of the intervention led to the improved knowledge and behavior, it is likely that the combination of consistent messaging and modeling from all care providers in the nurseries played a role. The changes in knowledge and behavior are consistent with the health belief model, which states that health-related behaviors are influenced by “cues to action” that prompt people to take a recommended health action.<sup>16</sup> Colson et al’s study of NISP data found that although only one-third of mothers

reported receiving positive advice from their physicians on supine sleep position, those who did were 3 times more likely to keep their babies supine.<sup>3</sup> Parents who received ISS education reported receiving information from a nurse or doctor significantly higher than those in the NISP benchmark. Parents reported receiving an adequate amount of education; they appeared receptive to the intervention and not overwhelmed with the content; and they relied on the messages from health care providers more frequently.

There are several limitations to this study. First, there were significant differences in demographics between study groups at discharge versus F/U and between the ISS group and NISP group. Given the differences in cultural sleep practices, having a larger sample of Caucasian parents may have skewed the results toward improved safe sleep outcomes. We were able to control for the differences in race in the NISP comparison by reevaluating the results for only Caucasian families, and we were still able to demonstrate significantly higher rates of key safe sleep behaviors in the ISS group. Although the NISP was not a perfect comparison group for our study, it is a representative sample of the current sleep positions of infants after discharge from the hospital, and it was practical because we could not create an in-hospital control group for ethical and feasibility reasons. Additionally, the predominantly Caucasian population may limit the translation of results to a more diverse population. However, other studies—such as Moon et al’s Women, Infants, and Children Program study and Rasinski et al’s study targeting largely African American neighborhoods in Chicago<sup>17</sup>—have shown that good parental education translates into improved ISS knowledge and behaviors in other cultural settings. Finally, because we used a self-reported survey, subjects could have answered “correctly” rather than realistically; however, the use of an anonymous format may have reduced the impulse to alter responses.

As noted by Dias et al, when reporting their program to prevent abusive head trauma in the nursery, a program has the greatest chance of success when it is simple,

contains a powerful message, is administered at the appropriate moment, and requires very little effort or time on the part of those who deliver the message and those who receive it.<sup>8</sup> An ISS prevention program meets these criteria and can be successfully implemented on a wide scale. While the messaging and behaviors of health care providers may need to change, we have demonstrated that the intervention is feasible in busy nursery settings and has significant impact on knowledge and behaviors that can reduce the risk of sleep-related infant deaths.

## Conclusion

Reinforcing the infant safe sleep message with an intensive hospital-based education program improves parental intentions to comply with the American Academy of Pediatrics' SIDS risk-reduction guidelines in the home, including supine sleep position, use of a crib without extraneous materials, and appropriate room temperature. Increasing family education on ISS with a consistent and repetitive message could translate into decreased infant sleep-related mortality.

## Appendix A: Sample Acknowledgment Form

**Instructions:** Complete one form for each infant. Provide parent(s) with information about safe infant sleep and Sudden Infant Death Syndrome prevention, and request that they voluntarily sign this form indicating that they have received the information. Provide them with one copy of this signed form, and retain a copy of this signed form in the infant's medical record.

YORK HOSPITAL

BABY'S LEGAL NAME \_\_\_\_\_

AKA: \_\_\_\_\_

DOB: \_\_\_\_\_ SEX: M  F

(MM/DD/YY)

PARENT(S) PROVIDED SUDDEN INFANT DEATH SYNDROME INFORMATION,

DATE: \_\_\_\_\_

(MM/DD/YY)

Parent: **I have received information about Sudden Infant Death Syndrome.**

**By signing this statement I agree that I have received this information and understand that:**

- **my baby should sleep on the back; sleeping on the side or tummy is dangerous.**
- **sleeping with my baby increases the risk of my baby dying from suffocation or SIDS.**

SIGNATURE, MOTHER: \_\_\_\_\_ DATE: \_\_\_\_\_

(MM/DD/YY)

MOTHER CHOSE NOT TO SIGN

SIGNATURE, FATHER: \_\_\_\_\_ DATE: \_\_\_\_\_

(MM/DD/YY)

FATHER CHOSE NOT TO SIGN

SIGNATURE, OTHER: \_\_\_\_\_ DATE: \_\_\_\_\_

(stepparent, adoptive parent, legal guardian, legal custodian) (MM/DD/YY)

OTHER CHOSE NOT TO SIGN

Patient Label



SUDDEN INFANT DEATH SYNDROME  
EDUCATION  
VOLUNTARY COMMITMENT STATEMENT  
NUR-110 R-4/11

## Appendix B: Sample Questionnaire for 4 month follow-up

1. Name of person filling in form:

2. Baby's Name:

3. Baby's Birthdate:

4. It is safest for my baby to sleep:  on his stomach  on his side  on his back  does not matter

5. It is safest for my baby to sleep: (choose 1)

In a crib or bassinette in the parents' room  In a crib or bed in a separate room

In bed with me  Does not matter

6. Which of the following are safe to have in the baby's sleep area: (you may fill in more than one answer)

pillows  stuffed animals and/or plush toys  comforters

positioners  bumpers  none of the above

7. Which of the following statements is correct: (choose 1)

It is best to bundle the baby with lots of blankets to keep him warm.

Sleeping with the baby is the best way to keep him warm.

Keeping the room temperature comfortable for a lightly dressed adult is safest for the baby.

It is safest to bundle the baby up to the chin with a thick blanket to stay warm.

8. Pacifiers are useful for reducing the risk of SIDS.

True  False

9. We have been given devices that say they prevent SIDS

Yes  No

10. We have bought devices that say they prevent SIDS.

Yes  No

11. My baby's crib/bassinette mattress is covered with:

A sheepskin  A thick quilt or blanket

A thin sheet  Nothing, the baby sleeps in my bed

12. Which of the following do you keep in the baby's crib or sleep area: (you may fill in more than one answer)

Pillows  Stuffed animals and/or plush toys  Comforters

Positioners  Bumpers  None of the above

13. How often do you give your baby a pacifier when she goes to sleep?

Every time  Most of the time  Sometimes  Rarely  Never

14. I keep the baby's room temperature set at:

62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78

15. Over the past 5 days, I have put my baby to sleep:

On his back always

On his side most of the time

On his back most of the time

On his stomach always

On his side always

On his stomach most of the time

**If you always put your baby on the back to sleep, skip question 16 and go to question 17.**

16. I don't always put my baby to sleep on her back because: (fill in any that are true for you)

- She changes position on her own anyway       I am afraid she will choke  
 She does not sleep as well on her back       Other family members told me not to  
 She does not look comfortable on her back       My doctor told me not to

17. Over the past 5 days, my baby has slept with me or another person:

- Every day    1 day    2 days    3 days    4 days    Never

**If you have slept with your baby at any time in the past 5 days, please answer questions 18 – 20. If You have not slept with your baby, go to question 21.**

18. I let my baby sleep with me because: (fill in any that are true for you)

- I do not have a crib or bassinette       It helps me bond with the baby  
 It keeps the baby from crying       It is convenient  
 It is easier to feed the baby       I want to sleep with my baby  
 I am breastfeeding       He has been sick recently  
 I get too tired to put him in the crib       Other:

19. How much do you worry that something bad could happen when your baby sleeps in bed with you?

- A lot    A little    Not at all

20. On average, over the past 5 nights, how many hours per night has the baby slept in bed with you?

- 1 2 3 4 5 6 7 8 9 10 11 12

21. At the hospital, I learned about infant sleep safety from: (fill in any that are true for you):

- My nurse       Medical pamphlets  
 My pediatrician or family doctor       Family members  
 Viewing a video or DVD       I was NOT taught about infant sleep safety

22. The amount of education I received on safe sleep for my baby in the hospital was:

- Too much    Not enough    Just right

23. What did you find most useful in learning about infant sleep safety? (choose 1)

- The video       Talking with my baby's doctor  
 Talking with the nurse       A combination of these techniques  
 Written materials       Nothing was helpful

24. How useful did you find signing the form about receiving information on infant sleep safety?

- It reminded me how important safe sleep is for my baby  
 Useful, but not as important as the education  
 Not useful, a waste of time

25. The milk that the baby is currently feeding is:

- Breast milk only    A combination of breast milk and formula    Formula only

26. We have planned on providing breast milk for the baby until she is how old? (choose 1)

- 2 weeks     4 weeks     6 weeks     3 months     4 months  
 5 months     9 months     12 months     Over 1 year

27. How successful do you feel about supplying breast milk for your baby?

- We are providing milk longer than we had planned to  
 We stopped providing milk sooner than we planned to  
 We are still providing milk as we originally planned to  
 We have been providing formula only since birth

28. If you did not achieve your breastfeeding goals, please check any reasons why:

- The baby never latched on well     Lack of support from family  
 Poor milk supply     Discouraged by the doctors  
 Mother not able to sleep with the baby     Lack of support from lactation services

29. When I leave my baby with another caregiver:

- I check to make sure they know about infant sleep safety  
 I assume they know how to take care of my baby  
 I don't leave my baby with other caregivers

30. I am the baby's:

- mother     father     grandmother     grandfather

31. How many weeks old is your baby?

12 13 14 15 16 17 18 19 20

32. My age is: \_\_\_\_\_ (please fill in the appropriate circles below):

33. My race is:

- Caucasian (white)     Asian     Latino/Hispanic     Native American  
 African-American     Other: \_\_\_\_\_

34. What grade did you finish in school?

6  7  8  9  10  11  12  13  14  15  16  > 16

35. The baby is a:

- boy  girl

36. How many **other** children have been born to this baby's mother?

0  1  2  3  4  5  6  7  8  9  10  11  12

37. The baby was delivered at which hospital (there are separate lists for York and Baltimore areas):

York Area:

- York     Memorial Gettysburg     Hanover     Other:

Baltimore Area:

- Franklin Square Johns Hopkins Bayview GBMC     St. Joseph's     Other:

38. What type of insurance does the baby have:

- Private/Commercial     Medical Assistance/Medicaid HMO     HMO/managed care     Self pay

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## Author Contributions

MHG conceptualized and designed the study, coordinated and supervised data collection, drafted the initial manuscript, critically reviewed the manuscript, and approved the final manuscript as submitted. TB assisted in the study design, coordinated data collection, carried out the initial analyses, critically reviewed and revised the manuscript, and approved the final manuscript as submitted. SDK assisted in the study design, coordinated and supervised data collection at one of the two sites, assisted in drafting the initial manuscript, critically reviewed the manuscript, and approved the final manuscript as submitted.

## Declaration of Conflicting Interests

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