Effect of a Sudden Infant Death Syndrome Risk Reduction Education Program on Risk Factor Compliance and Information Sources in Primarily Black Urban Communities

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ABSTRACT. *Background.* **In the US, a higher incidence of sudden infant death syndrome (SIDS) and a slower decline in the incidence of SIDS has been found among blacks when compared with white infants. The continued racial disparity in SIDS is thought to be attributable to lack of compliance with SIDS risk reduction recommendations.**

Objectives. **To better understand the disparities in SIDS risk reduction behaviors, we sought to study compliance and information sources related to SIDS among primarily black communities in a city with a high SIDS incidence rate before and after a targeted educational campaign.**

Design. **Pre- and post-SIDS Risk Reduction Education Program telephone surveys were performed in targeted Chicago communities with at least 86% blacks. Data collection for Survey 1 was from September 22 to November 4, 1999. Data collection for Survey 2 was from November 17, 2001, to January 12, 2002, 24 months after the aggressive implementation of a comprehensive, ethnically sensitive risk reduction program.**

Results. **Survey 1 analyzed data from 480 mothers with an infant <12 months of age (327 black, 66 white, and 87 Hispanic) and Survey 2 had 472 mothers (305 black, 77 white, and 90 Hispanic). The incidence of nighttime prone sleeping at Survey 1 was 25% among black respondents, 17% in whites, and 12% in Hispanics and decreased (but not significantly) among all groups by Survey 2. Overall, in Survey 2 compared with Survey 1, fewer mothers reported putting their infants on an adult bed, sofa, or cot both during the day and at night, with the biggest change seen in black mothers for daytime naps. Despite the same educational initiative, blacks increased the use of pillows, stuffed toys, and soft bedding in the sleep environment as compared with whites. More mothers in Survey 2 than in Survey 1 said that they noticed their infants sleeping on their back during the newborn hospitalization. Significantly more black and white mothers in Survey 2 compared with Survey 1 reported that a doctor or nurse had told them what the best position was for putting their infants to sleep, and all 3 groups said that the health care providers indicated that placing the infant on its back was the best sleep position. In examining the relationship between information sources and SIDS risk behaviors, among all groups observation of sleep position in hospital had no effect on behavior after newborn discharge; however, specific instruction by a nurse or doctor in the hospital about how to properly place the infant for sleep influenced behavior after the mother left the hospital.**

Conclusions. **The Surveys indicate the greatest impact of the SIDS risk factor educational initiative targeted at black communities was changing behaviors regarding safe sleep locations by reducing the incidence of infants placed for nighttime and daytime sleep in adult beds, sofas, or cots. Although these data indicate considerable progress as a result of the targeted educational initiative, our findings suggest that cultural explanations for specific infant care practices must be more clearly understood to close the gap between SIDS risk factor compliance and apparent knowledge about SIDS risk factors.** *Pediatrics* **2003;111:e347–e354. URL: http://www.pediatrics.org/cgi/content/full/111/4/e347;** ***infant care, sleep position, minority group health, health campaign.***

ABBREVIATIONS. SIDS, sudden infant death syndrome; SD, standard deviation; OR, odds ratio; CI, confidence interval.

Despite a steady decline since 1992 in the incidence of sudden infant death syndrome (SIDS) in the US, a higher incidence of SIDS and a slower decline in the incidence rate has been found among black infants when compared with white infants.[1–3] Although the overall SIDS rate declined from 1.2 per 1000 live births in 1992[1] to 0.72 per 1000 live births in 1998[2] and most recently 0.53 per 1000 births in 2000,[3] the black-white SIDS ratio increased from 2.16 (2.18 per 1000 births in 1992 for blacks compared with 1.01 for whites) to 2.57 (1.49 per 1000 births in 1998 for blacks compared with 0.58 for whites). Only with the provisional 2000 statistics has the black-white SIDS ratio begun to decline to 2.31 (1.13 per 1000 live births in 2000 for blacks compared with 0.49 for whites).[1–3]

SIDS risk reduction recommendations were widely distributed in 1992[4] and 1996[5] by the American Academy of Pediatrics. Despite this, and despite the Back to Sleep educational campaign in 1994,[6] the continued racial disparity in SIDS rates is thought to be attributable to lack of compliance with these recommendations. For example, the prevalence of the prone sleep position in the United States, once at 70% in 1992, has been documented as low as 24% in

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Received for publication Jul 31, 2002; accepted Dec 3, 2002.

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1996,[7–8] and according to an AAP Task Force,[9] currently stands at ~20%. However, Willinger et al[8] documented racial disparity in prone sleeping with 32% of black mothers placing their infants to sleep in the prone position as compared with 17% of nonblack mothers. Lesko et al[10] reported that 33% of black infants slept prone at 1 month with an increase to 43% at 3 months. Brenner et al[7] found that black mothers were more likely to place their 3-month-old and 7-month-old infants in a prone sleep position when compared with primarily Hispanic mothers. Similarly, Kemp et al[11] reported that more black infants were placed on soft bedding, which has a greater propensity to limit oxygen availability and exhaled carbon dioxide dispersal, than were white infants.

To better understand the disparities in SIDS risk reduction behaviors, we sought to study compliance and information sources related to SIDS among primarily black communities in a city with a high SIDS incidence rate before and after a targeted educational campaign. Chicago, Illinois, was identified because of its relatively high SIDS rate (1.4 per 1000 live births, nearly twice the overall 1998 national rate[2]) and pattern of racial disparities in incidence and decline. Between 1992 and 1999, the SIDS rate in Chicago declined from 2.1 to 0.9 per 1000 live births and the black to white SIDS ratio increased from 2.8 to 9.0 (3.4 and 1.8 per 1000 live births for blacks compared with 1.2 to 1.8 per 1000 live births for whites). These data were obtained from the SIDS Alliance of Illinois. A cross-sectional survey was conducted to assess SIDS risk behaviors. Information learned from the initial data analysis was applied to a concentrated SIDS Risk Reduction Education Program targeted at primarily black communities, and a second cross-sectional survey was completed to assess the effectiveness of the intervention.

METHODS

Source of Survey Populations

Demographic and health-related information by community from the Chicago Department of Health Community Area Health Inventory (Volume 1 [1995–1997] May 1999) was used to select communities based on demographic and health factors related to risk for SIDS. Targeted communities that included at least 86% black residents were identified from among the 77 Chicago communities ranked the highest for birth and infant mortality rates and the lowest for education and income. Census block numbers for each of the communities were obtained and, using a file from the US Census Bureau, zip codes were linked to communities.

A list of households with directory-listed telephone numbers within these zip code areas in which there was likely to be an infant who was 12 months old or younger was obtained from a division of Experian (Costa Mesa, CA), formerly known as Metromail. This vendor was previously used successfully in a recent national study of infant sleep position.[12] Although Experian guaranteed that at least 50% of the contacts they identified nationally would provide a household with an infant of 12 months old or younger, the rate within Chicago was unknown. When the surveys were conducted, it was determined that 46% of the contacts Experian identified provided a household with an infant of 12 months old or younger. Hispanics and whites contacted as part of the sample (residents of the primarily black communities) were included as respondents in the surveys, providing small but demographically similar comparison groups to the primarily black respondents. The sample size was determined by the number of households with mothers of infants in the list sample. Additional mothers could have been found but this would have required an expensive screening process beyond the resources available for this study. Although the procedure does not insure that the obtained sample is representative of the communities, demographic analysis of sample respondents presented later indicate that the 2 survey samples are roughly comparable.

Survey Questionnaire

After reviewing the literature on factors known to increase the risk of SIDS, topics were categorized and questionnaire items were developed. Substantive areas for questioning included infant sleep position, whether the infant slept alone or with others, where the infant slept, whether pillows and/or soft toys and bedding materials were present while the infant slept, whether >1 blanket was used during sleep, and whether the infant was exposed to cigarette smoke in utero or after birth. Consistent with questions used by Willinger et al[8,12] in the National Infant Sleep Position Study and by Brenner et al,[7] our questions referred to the mother's usual behavior. Mothers were also asked about their information sources regarding SIDS and infant care in general. Specific sources considered included doctor, nurse, relatives, the television, radio, newspaper, brochures, magazines, public library, church, clinic, and a community center.

Both the pre- and post-SIDS Risk Reduction Education Program surveys were approved by the Social Sciences Institutional Review Board at the University of Chicago. Data were collected using a Computer-Assisted Telephone Interviewing system. The data collection for the first survey began on September 22, 1999, and ended on November 4, 1999. The data collection for the second survey began 24 months after the introduction of the aggressive implementation of the risk reduction program. Survey 2 began on November 17, 2001, and ended on January 12, 2002. Most of the telephone calls were made during the evening hours, between 5 PM and 9 PM on weekdays, and throughout the day on weekends.

Intervention

A SIDS Risk Reduction Education Program was sponsored by the SIDS Alliance of Illinois, the Chicago Department of Public Health, and the CJ Foundation for SIDS. The goal of the program was to provide SIDS risk reduction education to largely black neighborhoods in the city of Chicago by meeting with health care professionals in frequent contact with mothers of infants <1 year old, as well as pregnant women. The educational presentations took place at the Supplementary Women, Infants, and Children program, health care clinics located in the targeted high-risk communities, high schools and other alternative schools focused on pregnant and parenting teens, and community forums including churches and health fairs. More than 70 professional training sessions (nurses, doctors, child care providers) with each audience including 22 to 176 individuals were conducted. Over 250 clinic sessions with each audience including 9 to 100 pregnant mothers were conducted. More than 110 church sessions with each audience including 20 to 45 mothers, grandmothers, and other family members were conducted. Over 100 neighborhood health fairs with each audience including 19 to 300 attendees were conducted. The risk reduction educators were specifically trained in terms of educational background and social skills to clearly and consistently deliver the risk reduction education message to diverse populations and communities. Each community was addressed every 2 to 4 weeks throughout the period after the first survey and before the second survey (November 5, 1999 until November 16, 2001), with modalities including small and large group formats, pamphlets and other culturally sensitive written material, and visual displays. Black religious leaders and other community leaders were also included in promoting the educational initiative. The educators specifically recommended using the supine sleep position, putting infants to sleep in a crib, removing pillows and other stuffed toys and soft bedding materials from the sleep environment, using a sleep sack or feet to foot sleeping and other ways to prevent accidental suffocation, and avoidance of smoking during the pregnancy and after by the mother and other family members. All but 1 of the educators was black.

Statistical Analysis

The following statistical methods were used in the analysis. When comparing means, such as those calculated from age, education, and income, analysis of variance was used with follow-up

analyses using the Duncan procedure. When examining the relationship between a dichotomous variable, such as reports of putting the infant on its stomach to sleep, and another dichotomous variable, such as a survey, χ^2 tests were used. To examine the relationship between the 3-category race variable and dichotomous variables, race was coded into 2 dummy variables and logistic regression was used. Logistic regression was also used to compute odds ratios (OR) and their corresponding 95% confidence intervals (CI).

RESULTS

Surveys 1 and 2: Demographic Characteristics

The Survey 1 sample consisted of 501 mothers in the city of Chicago (78% response rate). Because the analysis focused on race, 21 respondents who either refused to state their race or ethnic status or reported being members of ethnic groups such that when grouped included too few respondents to permit statistical analyses (eg, Asian, Native American) were removed from the data. The analytic sample for Survey 1 consisted of 480 respondents, each a mother with an infant <12 months of age. The sample included 327 blacks (68.1%), 66 whites (13.7%), and 87 Hispanics (18.1%). Specific data by race regarding mother's age, years of education, employment, income, married, first-time mothers, and infant age are provided in Table 1.

Survey 2 consisted of 498 mothers (79% response rate). As in Survey 1, 26 respondents in Survey 2 who either refused to state their race or ethnic status or who reported being members of small ethnic groups were removed from the data. The analytic sample for Survey 2 consisted of 472 respondents, each a mother with an infant <12 months old. The sample included 305 blacks (64.6%), 77 whites (16.3%), and 90 Hispanics (19.1%). Specific data by race regarding mother's age, years of education, employment, income, married, first-time mothers, and infant age are provided in Table 1.

Although every effort was made to replicate Survey 1, demographic differences were identified between the 2 samples at a $P < .05$ level. White and Hispanic respondents in Survey 2 were slightly but significantly more educated than those in Survey 1; all groups in Survey 2 had significantly higher incomes than in Survey 1. Although income is not reported in constant dollars, the difference in income between the 2 samples was greater than the 2.8% inflation rate for the years separating the samples, as determined by the inflation calculator available on the Bureau of Labor Statistics Web site (www.bls.gov). White respondents in Survey 2 were significantly more likely to be married and less likely to be first-time mothers than their Survey 1 counterparts.

Information Sources

Mothers in both surveys were asked about experiences they had in the hospital and with their medical care providers regarding risks associated with prone positioning and smoking. Results overall and by race are shown in Table 2. Overall, equal percentages of mothers in Survey 1 and Survey 2 noticed the infant sleep position used in the hospital at the time of delivery. More mothers in Survey 2 than in Survey 1 said that they noticed their infants sleeping on their

TABLE 1. Respondent Demographics by Race/Ethnicity and by Survey

Respondent Demographics	Race/Ethnicity							
	Black		White		Hispanic		Total	
	Survey 1 $n = 327$	Survey 2 $n = 305$	Survey 1 $n = 66$	Survey 2 $n = 77$	Survey 1 $n = 87$	Survey 2 $n = 90$	Survey 1 $n = 480$	Survey 2 $n = 472$
Average mother's age (y)	26.7 (6.78)	26.5 (6.61)	30.8 (5.60)	31.7 (5.45)	26.1 (5.14)	26.4 (6.12)	27.2 (6.52)	27.3% (6.62)
Average years of education	13.5 (2.15)	13.6 (2.34)	14.8 (2.84)	16.3* (2.48)	12.0 (2.32)	13.1* (2.79)	13.4 (2.41)	13.9%* (2.66)
Percent employed full-time	45.3 (48.78)	44.2 (49.66)	33.3 (47.13)	41.5 (49.27)	41.4 (49.25)	38.9 (48.75)	42.9 (49.49)	42.8% (49.48)
Percent employed part-time	15.5 (36.19)	11.5 (31.90)	19.7 (39.77)	16.9 (37.48)	12.6 (33.18)	11.1 (31.41)	15.2 (35.90)	12.2% (32.73)
Average household income adjusted for number in household†	$10 055 ($5650)	$11 279* ($7483)	$14 163 ($6811)	$18 640* ($7696)	$9565 ($5587)	$12 049* ($7581)	$10 532 ($6977)	$12 631* ($7984)
Percent married	32.5% (46.84)	37.7% (46.46)	80.3% (39.77)	96.1%* (19.36)	67.8% (46.72)	70.0% (45.83)	45.5% (49.80)	53.4%* (49.88)
Percent first time mothers	45.9% (49.83)	40.7% (49.13)	54.5% (49.80)	37.7%* (48.46)	52.9% (49.92)	38.3% (48.61)	48.3% (49.97)	39.8%* (48.95)
Average age of infant in days	190.2 (81.16)	188.2 (89.94)	207.6 (91.16)	194.0 (99.72)	186.3 (77.26)	184.1 (91.02)	191.9 (79.90)	188.4 (91.47)

* Indicates significant difference determined by t test with $P < .05$ between Survey 1 and Survey 2 within race/ethnic group.
Numbers in parentheses are SDs.
† Adjusted household income was calculated by dividing the median of the total household income category by the number of adults in the household.

TABLE 2. Percent (SD) of Respondents Reporting SIDS-Related Information by Race/Ethnicity and by Survey

SIDS-Related Information	Race/Ethnicity							
	Black		White		Hispanic		Total	
	Survey 1 $n = 327$	Survey 2 $n = 305$	Survey 1 $n = 66$	Survey 2 $n = 77$	Survey 1 $n = 87$	Survey 2 $n = 90$	Survey 1 $n = 480$	Survey 2 $n = 472$
Noticed infant's sleep position in hospital	85.93 (34.77)	89.77 (30.30)	77.27 (41.91)	76.32 (42.51)	81.61 (38.74)	82.22 (38.23)	83.96 (36.70)	86.14 (34.55)
Noticed infant sleeping on back	52.86 (49.92)	64.34* (47.90)	60.78 (48.82)	55.17 (49.73)	49.30 (50.00)	60.81 (48.82)	53.23 (49.90)	62.38* (48.44)
Doctor or nurse indicated best sleep position	81.35 (38.95)	86.23* (34.46)	77.27 (41.91)	90.91* (28.75)	74.71 (43.47)	80.00 (40.00)	79.58 (40.31)	85.51* (35.20)
Doctor or nurse recommended back as best sleep position	22.26 (41.60)	69.58* (46.01)	21.57 (41.13)	84.29* (36.39)	32.31 (46.77)	65.28* (47.61)	23.88 (42.64)	71.36* (45.21)
Doctor or nurse talked about hazards of smoking	59.63 (49.06)	74.75* (43.44)	37.88 (48.51)	46.75 (49.89)	56.32 (49.60)	71.11* (45.33)	56.04 (49.63)	69.49* (46.04)

* Indicates significant difference determined by χ^2 test with $P < .05$ between Survey 1 and Survey 2 within race/ethnic group.

backs. This difference was significant for blacks but not for the other 2 groups. Significantly more black and white mothers in Survey 2 compared with Survey 1 reported that a doctor or nurse had told them what the best position was for putting their infants to sleep. The difference is in the same direction for Hispanics but is not significant. However, more mothers in all 3 groups in Survey 2, compared with Survey 1, said that the health care providers indicated that placing the infant on its back was the best sleep position. Similarly, more mothers in Survey 2 than in Survey 1 indicated that their doctor or nurse had talked to them about the hazards of smoking around the infant. Analysis of the individual groups indicate that this was particularly true for black and Hispanic mothers.

Table 3 lists the information sources for sleep positioning. More mothers in all groups in Survey 2 compared with Survey 1 reported hearing about placing their infants on their backs for sleeping from each of the specified sources listed in Table 3. Although all of the comparisons are significant, the significance levels are overstated because of a methodological artifact. In Survey 1 we asked the question about information sources only to those mothers who reported placing their infants in other than a supine position either for nighttime or daytime sleep ($n = 239$). In Survey 2 we asked the question about information sources to all mothers. To simplify the exposition, we have presented the data in Table 3 as if we asked the question of all mothers in Survey 1. Extensive analyses were conducted to attempt to equate the samples by limiting Survey 2 analysis to only those mothers who reported nonsupine positioning. The magnitude of the effects of information sources are the same although they are significant only for the entire sample and for blacks, because the sample sizes are reduced. Despite this artifact, we are confident that a substantially higher percentage of mothers in Survey 2 received information through multiple sources, including their health care providers, in Survey 2 than in Survey 1.

Changes in SIDS-Related Risk Factor Compliance: Survey 1 versus Survey 2

Data regarding changes in SIDS-related risk factor compliance are shown in Table 4 for the total dataset and by race group. Overall, fewer mothers reported putting their infants on an adult bed, sofa, or cot both during the day and at night. In both cases, the biggest change was seen in black mothers for daytime naps. Table 4 indicates a significant increase at Survey 2 in the percentage of black mothers who reported including pillows or stuffed toys when they put their infants to sleep either in the daytime or at night. The opposite pattern is seen for white mothers, with a decrease in reports of using these objects in the infant's sleep environment in Survey 2 compared with Survey 1.

Relationship Between Information Sources and SIDS Risk Behaviors

In both surveys, we collected information about whether the mother observed that her infant was

TABLE 3. Information Sources (Percent, SD) Recommending Supine Positioning by Race/Ethnicity and by Survey

Information Source for Placing Infant on Back	Race/Ethnicity							
	Black		White		Hispanic		Total	
	Survey 1 $n = 327$	Survey 2 $n = 305$	Survey 1 $n = 66$	Survey 2 $n = 77$	Survey 1 $n = 87$	Survey 2 $n = 90$	Survey 1 $n = 480$	Survey 2 $n = 472$
Mother	1.53 (12.29)	30.49 (46.11)	1.52 (12.31)	13.00 (33.84)	4.60 (21.06)	34.44 (47.78)	2.08 (14.30)	28.39 (45.14)
Other relative	2.45 (15.47)	34.75 (47.70)	1.52 (12.31)	25.97 (44.14)	1.15 (10.72)	31.11 (46.55)	2.08 (14.30)	32.63 (46.93)
Friend	3.67 (18.83)	28.52 (45.23)	3.03 (17.27)	33.77 (47.60)	3.49 (18.35)	31.11 (46.55)	3.54 (18.50)	29.87 (45.82)
Doctor	25.69 (43.76)	74.10 (43.88)	25.76 (44.07)	83.12 (37.71)	17.24 (37.99)	65.56 (47.78)	24.17 (42.85)	73.94 (43.94)
Nurse	11.62 (32.10)	76.07 (42.74)	15.15 (36.13)	81.82 (38.82)	5.75 (23.41)	61.11 (49.02)	11.04 (31.37)	74.15 (43.82)
Community health group	1.22 (11.01)	27.54 (44.75)	0.00 (0.00)	6.49 (24.80)	0.00 (0.00)	16.67 (37.48)	0.83 (9.10)	22.03 (41.49)
Clinic	5.20 (22.23)	43.93 (49.71)	3.03 (17.27)	16.88 (37.71)	4.60 (21.06)	33.33 (47.40)	4.79 (21.38)	37.50 (48.46)
Brochure	6.73 (25.10)	61.64 (48.71)	6.06 (24.04)	58.44 (49.61)	5.75 (23.41)	48.89 (50.27)	6.46 (24.60)	58.69 (49.29)
Magazine	23.55 (42.50)	76.39 (42.54)	31.82 (46.93)	81.82 (38.82)	17.24 (37.99)	71.11 (45.58)	23.54 (42.47)	76.27 (42.59)
Newspaper	0.61 (7.81)	18.03 (38.51)	1.52 (12.31)	23.38 (42.60)	1.15 (10.72)	22.22 (41.81)	0.83 (9.10)	19.70 (39.82)
Television	8.87 (28.47)	41.31 (49.32)	12.12 (32.89)	36.36 (48.42)	14.94 (35.86)	36.67 (48.46)	10.42 (30.58)	39.62 (48.96)
Radio	0.31 (5.53)	21.63 (41.25)	0.00 (0.00)	16.88 (37.71)	1.15 (10.72)	23.33 (42.53)	0.42 (6.45)	21.19 (40.91)

All comparisons between Survey 1 and Survey 2, overall and within race groups are significant as determined by χ^2 test with $P < .05$ (see explanation of the table in "Results" section).

TABLE 4. Percent (SD) of Respondents Engaging in SIDS Risk Behaviors by Race/Ethnicity and by Survey

SIDS Risk Behaviors	Race/Ethnicity							
	Black		White		Hispanic		Total	
	Survey 1 $n = 327$	Survey 2 $n = 305$	Survey 1 $n = 66$	Survey 2 $n = 77$	Survey 1 $n = 87$	Survey 2 $n = 90$	Survey 1 $n = 480$	Survey 2 $n = 472$
Sleeping on stomach at night	24.5% (43.01)	21.0% (40.73)	16.7% (37.30)	9.1% (28.76)	11.5% (31.90)	8.9% (28.47)	21.0% (40.73)	16.8% (37.39)
Sleeping on stomach during the day	25.7% (43.70)	23.3% (42.27)	18.2% (38.58)	11.7% (32.14)	18.4% (38.75)	10.0% (30.00)	23.3% (42.47)	18.9% (39.15)
Sleeping on adult bed, sofa, or cot at night	42.2% (49.39)	35.4% (47.82)	6.1% (23.93)	11.7% (32.14)	25.3% (43.47)	17.8% (38.25)	34.2% (47.44)	28.2%* (45.00)
Sleeping on adult bed, sofa, or cot during the day	41.9% (49.34)	26.6%* (44.19)	19.7% (39.77)	7.8%* (26.82)	29.9% (45.78)	24.4% (42.95)	36.7% (48.20)	23.1%* (42.15)
Sleeping with pillows or stuffed toys at night	11.6% (32.02)	17.7%* (38.17)	30.3% (45.96)	15.6%* (36.29)	16.1% (36.75)	21.1% (40.80)	15.0% (35.71)	18.0% (38.42)
Sleeping with pillows or stuffed toys during the day	10.1% (30.13)	17.7%* (38.17)	25.8% (43.75)	13.0%* (33.63)	14.9% (35.61)	21.1% (40.80)	13.1% (33.74)	17.6% (38.08)
Sleeping with 2 or more blankets at night	14.7% (35.41)	13.8% (34.49)	10.1% (30.13)	15.6% (36.29)	18.4% (38.75)	15.6% (36.29)	14.8% (35.51)	14.4% (35.11)
Sleeping with 2 or more blankets during the day	8.9% (28.47)	10.8% (31.04)	6.1% (23.93)	6.5% (24.65)	3.4% (18.12)	5.6% (22.99)	7.5% (26.34)	9.1% (28.76)
Mother smoked during pregnancy	5.5% (22.80)	3.9% (19.36)	10.6% (30.78)	3.9% (19.36)	2.3% (14.99)	4.4% (20.51)	5.6% (22.99)	4.0% (19.60)
Mother currently smokes	10.7% (30.91)	9.5% (29.32)	10.6% (30.78)	9.1% (9.10)	10.3% (20.30)	6.7% (25.00)	10.6% (30.78)	8.9% (28.47)

* Indicates significant difference between Survey 1 and Survey 2 determined by χ^2 with $P < .05$.

TABLE 5. Logistic Regression of Prone Positioning at Night by Survey, Instruction, Observation, Interactions, and Background Characteristics

	All Respondents		Blacks	
	OR	95% CI	OR	95% CI
Survey	1.254	0.586–2.681	1.495	0.617–3.620
Instruct	1.344	0.774–2.335	1.432	0.742–2.763
Survey X Instruct	0.395[a]	0.175–0.892	0.330*	0.126–0.865
Observe	1.024	0.645–1.626	1.131	0.666–1.920
Survey X Observe	0.876	0.447–1.716	0.640	0.296–1.385
Parity	1.053	0.744–1.491	0.685	0.438–1.010
Marital status	1.046	0.724–1.511	1.704[a]	1.071–2.711
Adjusted income	0.984	0.947–1.022	0.972	0.931–1.016
Education	0.962	0.893–1.036	0.946	0.854–1.048
Log likelihood χ^2 (*df*)	12.530 (9), $P = .1850$		15.714 (9), $P = .073$	

* $P < .05$.

sleeping on his/her back in the hospital and on whether a doctor or nurse in the hospital had instructed her to place her infant in a supine position for sleeping. We used logistic regression to determine whether these variables had an effect on sleep position. Results are presented in Tables 5 and 6. The statistically nonsignificant Survey X Observe interaction terms indicate that observation of sleep position in the hospital had no effect on behavior after the mother left the hospital. The statistically significant Survey X Instruct interaction terms indicate that mothers who were instructed to put their infants on their backs by nurses and doctors were more likely to do so in Survey 2 (that is, less likely to put their infants in a prone position) than in Survey 1. These results, together with the findings from Table 3 that more mothers reported receiving information about sleep position from their medical providers in Survey 2, suggest that that the dissemination of information about sleep position had a positive effect on behavior.

DISCUSSION

To our knowledge, this study represents the first assessment of a targeted intervention directed at teaching SIDS risk reduction measures in primarily black communities. Although a racial disparity in SIDS incidence has long been recognized, the intervention initiatives have only recently become more culturally sensitive by showing infants of color on brochures and in media coverage. Our data suggest that the general initiatives that have been in place since 1992[4–6] have been incorporated into infant care practice in the primarily black communities studied. Specifically, our data indicate that the incidence of nighttime prone sleeping was already at 25% in the black respondents, 17% in the white respondents, and 12% in the Hispanic respondents before the culturally sensitive educational initiative was instituted in Chicago. These values indicate compliance with the Back to Sleep recommendations when compared with the national survey values published by Willinger et al,[8] indicating prone placement of 32% in black infants and 17% in white infants in 1998. Because the incidence of night and day prone sleeping for black infants did not decrease below national figures for white infants after the targeted Chicago campaign, although the knowledge about the supine position recommendation soared, these data identify a need for better understanding of prone position selection by black mothers as compared with white and Hispanic mothers.

The greatest impact of the SIDS risk factor educational initiative targeted at black communities was in changing behaviors regarding safe sleep locations. The Chicago campaign specifically taught parents and health care professionals that infants should be put to bed in cribs. Black respondents reported that 42% of their infants slept in an adult bed, sofa, or cot during the night and day before the campaign, but the incidence declined to 35% and 27% for night and day, respectively, after the campaign. Our data indicate 2 notable outcomes: the campaign changed a culturally entrenched behavior that is distinctly different from the white and Hispanic residents of similar communities, and although targeted toward black infants, the incidence of placing infants to sleep in adult beds, sofas, or cots for daytime sleep declined by nearly 50% among white respondents.

Several of the modifiable SIDS risk factors were at a low level before the educational campaign was initiated. For example, the percentage of infants sleeping with 2 or more blankets at night was already low (15% for blacks, 10% for whites, and 18% for Hispanics for nighttime sleep) before the education initiative, leaving little room for improvement. Although the incidence of maternal smoking may reflect underreporting, it was consistently low before

TABLE 6. Logistic Regression of Prone Positioning During the Day by Survey, Instruction, Observation, Interactions, and Background Characteristics

	All Respondents		Blacks	
	OR	95% CI	OR	95% CI
Survey	1.336	0.635–2.809	1.956	0.826–4.630
Instruct	1.526	0.899–2.589	1.489	0.781–2.838
Survey X Instruct	0.417*	0.189–0.920	0.286*	0.112–0.732
Observe	0.871	0.556–1.363	0.971	0.577–1.635
Survey X Observe	0.849	0.45–1.620	0.652	0.307–1.381
Parity	0.979	0.701–1.368	0.677	0.451–1.017
Marital status	0.990	0.695–1.410	1.559	0.993–2.448
Adjusted income	0.999	0.964–1.036	0.983	0.943–1.025
Education	0.987	0.919–1.060	1.002	0.908–1.106
Log likelihood χ^2 (*df*)	10.869 (9), $P = .285$		15.422 (9), $P = .080$	

* $P < .05$.

the education initiatives for values during and after pregnancy, again leaving little room for the effect of the targeted educational campaign in Chicago.

We did identify 1 apparent negative effect of the campaign: the data indicate an increase in percentage of black infants with pillows or stuffed toys in the sleep environment, both night and day, despite the educational initiative that specifically taught that the sleep environment should be free of pillows, stuffed toys, and soft bedding materials. These values increased from 12% to 18% by night and 10% to 18% during the day for the black infants. Despite exposure to the same educational initiatives, the values among white respondents declined from 30% to 16% during the night and 26% to 13% during the day. Specific reasons for this increase among the black infants need to be understood.

Although we have not identified published pre- and posteducational SIDS risk factor educational initiatives in black communities, several studies from the United States and abroad have identified the substantial effects of global campaigns. In the United States, Pollack and Frohna[13] used survey data for the 1996–1998 birth cohorts and reported that the change in sleep position improved overall, although among blacks the movement toward the supine sleep position was slower than observed in other racial groups and behind public health goals. They reported that the pattern of their results matched those by Willinger et al[8] from the National Infant Sleep Position Study that documented a decline in prone placement from 44% to 17% among white infants and from 53% to 32% among black infants. Wennergren et al[14] reported a decline in prone sleep position from 42% to 15% in Sweden, 9% to 5% in Norway, and 3.9% to 3.4% in Denmark from the Nordic Epidemiologic SIDS Study. Although their intervention did not have an effect on smoking during pregnancy, it resulted in a decline in smoking after delivery in Sweden from 34% to 22% and in Denmark from 48% to 20%. Keichl-Kohlendorfer et al[15] reported a decline in prone sleep position from 54% to 5%, and a decline in maternal smoking during pregnancy from 23% to 15% in response to an intervention campaign in Austria. In Avon,[16] United Kingdom, after an intervention campaign the proportion of infants sleeping prone decreased from 59% in 1988 to 2% in 1992. In New Zealand, the first country to launch a formal program to reduce risk factors for SIDS, Mitchell et al[17] reported a significant decline in prone sleeping from 43% before the intervention (1987–1988) to $<5\%$ postintervention (1993). Other risk factors such as maternal smoking did not change over this time period. These studies demonstrate that intervention programs can be exceedingly effective. However, other specific risk factors and communities with a disproportionately increased SIDS risk need to be targeted more intensively in future educational campaigns.

Published data for information sources regarding modifiable risk factors for SIDS vary considerably by country. In Avon, United Kingdom, the media has been the key source of success in spreading the word about placing infants on their back to reduce the risk of SIDS. A total of 86% to 88% of women of childbearing age (16–44 years old) interviewed by the Office of Population, Censuses and Surveys, which monitored the information campaign, reported that they learned from television that placing an infant on its back to sleep would reduce the risk of SIDS, 36% to 45% reported learning from newspapers or magazines, and only 6% to 12% reported learning this information from health professionals.[18] Lesko et al[10] reported that only 20% to 25% of mothers obtained information from printed materials such as magazines, newspapers, or brochures from hospitals and clinics, yet these sources were cited as the most influential source of sleep position advice. Willinger et al[8] reported that physician recommendation of "supine not prone" had the strongest influence on behavior, and that recommendations from the physician, neonatal nurse, reading material, and radio/television increased the probability of supine placement. Mehanni et al[19] reported that mothers in Ireland received their information from the following sources in decreasing order: magazine/newspaper (51%), public health nurse (44%), television (32%), family (22%), friends (21%), midwife (19%), and a general practitioner (16%). In our study, the sources of information were: magazine (88%), nurse (87%), doctor (85%), brochure (70%), clinic (50%), television (47%), community health group (32%), radio (25%), newspaper (21%), health fair (12%), and church (5%).

These results are consistent with the success of a multitude of sources reaching the black mothers found in our study. The disproportionate figures for television in Chicago are likely related to media coverage that escalated locally just before to the second survey. However, it does not appear that any of the media initiatives reported in the literature were culturally sensitive, suggesting a potential avenue for additional education in primarily black communities. Another logical educational source is the birth hospital. Our data indicate that 64% of the preintervention respondents identified seeing the supine position demonstrated versus 53% from our preintervention survey. If 100% of the mothers could see uniform use and recommendation of the supine position, coupled with specific educational programs by the nurse and doctor, we would anticipate an increase in supine positioning among the infants once they reach home.

Although the results of our study are encouraging, the results must be interpreted with some caution in light of their limitations. First, the study population included discrete neighborhoods with primarily black families, although white and Hispanic families in the vicinity were included for comparison. It is possible that the white and Hispanic families differ in some way from those living outside of the studied geographical boundaries, and may not serve as representative comparison groups. Second, there is the possibility that respondents reported their behavior in terms of what they thought was socially acceptable, even if it did not reflect their actual behavior practice. For example, mothers who preferred to put their infants to sleep prone may have reported that

they used the supine position because they had obtained this information somewhere and knew that it was what you were supposed to do. If this is the case, the reports may be underestimates of the true incidence of the SIDS-related behaviors, and if this tendency to give socially acceptable answers differed by groups, the differences in sleep positioning or placement might be even more prominent than described by the dataset. The tendency not to report socially unacceptable behaviors in surveys may account for the low incidence of smoking during pregnancy and after in this sample. If that is so, it is unfortunate because it restricted the analysis of an important risk factor, and it must be considered as a limitation. Third, although having relatively low incomes, our study populations were not among the poorest of families in Chicago. In addition, mothers in the study sample were older than average. Thus, it is possible that the sample did not include a substantial portion of mothers whose infants are most at risk for SIDS. Although this is a considerable limitation, our results are even more daunting when viewed in this perspective. If mothers who are a little older and a little better off economically are still practicing unsafe behaviors and still experiencing gaps in their information about sleep placement and other SIDS-related behaviors, this suggests that these elements in the younger, poorer groups may be even higher. Finally, because this study was conducted in only 1 large inner-city population, the results may differ from other large cities where there may be more intense poverty or other sociodemographic factors that would further impact compliance with SIDS risk behaviors.

Despite these limitations, we believe we have undertaken a rigorous investigation and are encouraged that intensive education programs can reach populations at risk. The education must begin with the health care provider, who must learn to reinforce risk reduction behaviors at every opportunity. Additional reinforcement from media and through social networks of family and friends is helpful. Targeting those communities in which risk is high and implementing culturally sensitive education programs shows promise in helping to bring the SIDS rate of black populations to the low levels currently seen among whites.

ACKNOWLEDGMENTS

Funding for this work was provided by the Nathan Cummings Foundation and the SIDS Alliance of Illinois.

We thank Deborah Schlueter (former executive director of the SIDS Alliance of Illinois) for her assistance in coordinating the educational campaign; the Chicago Department of Public Health and the CJ Foundation for SIDS for their support of the educational campaign; and Nancy Maruyama (director of educational services at the SIDS Alliance of Illinois) for her leadership and tireless participation in the educational campaign.

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Pediatrics 2003;111;e347

PEDIATRICS®
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