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The Impact of Nurse Case Management Home Visitation on Birth Outcomes in African-American Women

Natalie Wells, MD, MPH, **Tracy Sbrocco, PhD**, **Chiao-Wen Hsiao, MA**, **Lauren D. Hill, PhD**, **Nicole A. Vaughn, PhD**, and **Brenda Lockley, RN, MS**
Department of Preventive Medicine and Biometrics (Wells) and Department of Medical and Clinical Psychology, Uniformed Services University of the Health Sciences (Sbrocco, Hill), Bethesda, MD; Uniformed Services University Center for Health Disparities Research and Education (Sbrocco, Hsiao, Hill) Bethesda, MD; Center for Health Equality, Drexel University School of Public Health (Vaughn) Philadelphia, PA; African American Health Program, Office of Minority and Multicultural Health, Montgomery County, MD, Department of Health and Human Services (Lockley) Silver Spring, MD.

Abstract

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Despite substantial reductions in U.S. infant mortality rates, racial disparities persist, with black Americans experiencing 2.4 times the rate of their white counterparts. Low birthweight and preterm delivery contribute to this disparity.

Methods—To examine the association between antepartum nurse case management home visitation and the occurrence of low birthweight and preterm deliveries in African-American women in Montgomery County, MD, a retrospective cohort study was conducted using existing data from 109 mothers who were enrolled in the Black Babies Start More Infants Living Equally Healthy (SMILE) program. Logistic regression analysis was used.

Results—Women who received antepartum home visits were 0.37 (CI 0.15–0.94) times less likely to experience preterm delivery than women who did not receive antepartum home visits. The effect of antepartum home visits on preterm delivery was independent of level of prenatal care, negative life events and number of prior live births. There was no significant association between antepartum home visits and low birthweight.

Conclusion—Antepartum home visits appeared to be protective against preterm delivery and could contribute to reducing racial disparities in infant mortality. Further study is needed to understand and replicate specific program components that may contribute to improved birth outcomes in African-American women.

Send correspondence and reprint requests for *J Natl Med Assoc*. 2008;100:547–552 to: Dr. Natalie Wells, Threat Assessment Navy Environmental and Preventive Medicine, Unit 2, 1887 Powhatan St., Norfolk, VA 23511; phone: (757) 953-6567; fax: (757) 953-7212; natalie.wells@med.navy.mil .

Keywords

African Americans; obstetrics/gynecology

INTRODUCTION

Infant mortality is a measure of a nation's health. Despite substantial reductions in U.S. infant mortality during the past several decades, racial/ethnic disparities in infant mortality rates persist. One of two over-arching goals of *Healthy People 2010* is the elimination of health disparities, which are defined as differences in incidence, prevalence, mortality and burden of diseases and other adverse health conditions that exist among specific population groups in the United States.[1] A *Healthy People 2010* national objective for maternal and infant health is to reduce deaths among infants to ≤4.5 per 1,000 live births among all racial/ethnic groups.[1] The 2003 U.S. infant mortality rate was 6.85 per 1,000 live births.[2] The infant mortality rate in the African-American population is 2.4 times the rate in the white population.[2] Much of the racial disparity in infant mortality can be explained by high rates of low birthweight and preterm delivery among African Americans.[3]

Similar disparities exist in state-level infant mortality rates. The 2004 infant mortality rate for the state of Maryland was 8.4 per 1,000 live births.[4] The rate for white infants was 5.6 per 1,000 live births, compared to 14.8 per 1,000 live births for black infants.[4] In Montgomery County, MD, which is one the more affluent counties in the United States (median household income of $76,546 based on 2003 data), racial disparities in infant mortality persist.[4,5] In Montgomery County, the infant mortality rates are 5.5 per 1,000 live births and 15.7 per 1,000 live births in white and black infants, respectively.[4] The combination of premature births and low birthweights are the leading contributors to infant mortality among black women in Montgomery County.[4] The prevalence of preterm delivery and low birthweight infants in the black live births in Montgomery County is 12.4% and 15.3%, respectively.[4] These persistent racial/ethnic disparities underscore the need for prevention strategies that reduce preterm delivery and low birthweight, which may lead to infant death. Such strategies can extend and compliment traditional outpatient obstetric care, through patient referrals to innovative programs designed to enhance the care of pregnant women at risk, and to improve the health of their infants.

To address the issue of racial/ethnic disparities in infant mortality, Montgomery County has undertaken a concerted effort to close the gap. The African American Health Program, created by members of the community in collaboration with the Montgomery County Department of Health and Human Services, developed strategies for eliminating health disparities impacting Montgomery County's African-American population.[6] One of these efforts is the Black Babies Start More Infants Living Equally Healthy (SMILE) Program. Black Babies SMILE is a free nurse case management/home visitation program. The program began in 2003 with a long-term goal to reduce the number of African-American infant deaths in Montgomery County. The primary objective of the program is to reduce the number of low-birthweight and preterm infants.[6] This program features home visits during pregnancy and postnatal periods as well as seminars and events to engage pregnant women in conversation regarding topics related to pregnancy. The criteria for enrollment are liberal. Participants must be black/African American and live in Montgomery County. There are no restrictions placed on age, parity, income, education, insurance or citizenship.

The current study represents a collaborative effort among university researchers, a county health department and community partners. Using a community-based participatory research philosophy,[7] study questions were largely driven by the priorities of the community, rather

than the university. The purpose of this study was to examine the impact of the Black Babies SMILE program by analyzing the association between antepartum home visits and adverse birth outcomes.

METHODS

Black Babies SMILE uses a multicomponent intervention comprising education, support and referral to community services. The program incorporates best practices of other home visiting programs, such as Healthy Start. The program addresses such key influencing factors as stress, hypertension, diabetes, alcohol and illicit drug use, and smoking. Education topics include the stages of pregnancy, signs of preterm labor, breast feeding and child development. Typical referrals are for healthcare, clothing, food, cribs, car seats, breast pumps, smoking cessation and substance abuse. The nurse case managers do not deliver clinical prenatal or postpartum care. The nurse case managers work cooperatively with the primary care providers of the clients.

Three full-time nurse case managers are employed by the Black Babies SMILE program. The client:nurse ratio is 50:1. Home visits occur at a minimum of once a month. Generally, the desires and needs of the clients determine the frequency of home visits. Clients enter the program from self-referral, physician referral or referral from other community service programs (i.e., Healthy Start, Infants at Risk or Child Protective Services). Clients may enter the program before or after delivery of the infant of interest. Clients are discharged from the program once the infant of interest reaches one year in age.

This retrospective cohort study evaluated the impact of nurse case management and home visitation on birth outcomes in African-American women in Montgomery County. The objectives were: 1) to compare maternal demographic and clinical characteristics of women who received antepartum home visits versus women who did not, and 2) to compare the occurrence of preterm delivery and low birthweight in program participants who received antepartum home visitation with participants who did not receive antepartum home visitation. Approval from the institutional review board of the Uniformed Services University of Health Sciences was obtained prior to conducting the analysis.

Our study population was comprised of non-Hispanic black Caribbean, African or African-American pregnant or recently delivered county residents enrolled in the Black Babies SMILE program. The study population was restricted to all singleton births for mothers enrolled in the program from January 1, 2003 through December 31, 2005. The mothers who did not have corresponding infant/birth data were excluded from the analyses because infant data was the main outcome of interest. In addition, the mothers with multiple births were excluded to ensure comparability of results. Of the 132 mothers enrolled in the program from January 2003 through December 2005, only two mothers had multiple births. Of the remaining 130 mothers, 109 cases were identified and included in the analyses. Finally, for the purpose of the analyses, we divided the mothers into two groups: the mothers who received antepartum home visitation versus the mothers who did not receive antepartum home visitation. The former group was defined as the mothers who entered the program and received home visits prior to delivery; and the latter group was defined as the moth- ers who entered the program after delivery of the infant of interest. Participants were not randomly assigned to these conditions. The demographic and clinical characteristics of the women who received antepartum home visitations versus women who did not were compared.

We reviewed nurse case management records to extract data about birthweight and length of gestation in both groups. Gestational age was dichotomized as preterm (<37 weeks) and full

term (≥37 weeks). Similarly, birthweight was dichotomized as low birthweight (<2,500 g) and normal birthweight (≥2,500 g).

We ascertained maternal demographic and clinical characteristics that may influence the association of antepartum home visits and birth outcomes from nurse case management records and hospital discharge summaries when available: maternal education level (less-than-high-school education or high-school graduate), parity, marital status (married or not married), referral source (service agency referral or self/health provider referral), tobacco use during pregnancy (yes or no), participation in Medicaid (yes or no), maternal nativity (United States or foreign born), and the presence or absence of pregnancy risk factors (defined as presence of risk factors during the current pregnancy that could affect preterm births and low-birthweight babies—such as obesity, hypertension, diabetes, cardiac disease, uterine bleeding, reproductive tract infections and eclampsia), and the presence or absence of negative life events. Examples of negative life events included unstable housing, loss of employment, relationship problems, family problems and maternal illness. Maternal age was categorized into: <18 years, 18–24 years, 25–29 years, 30–34 years and ≥35 years. Level of prenatal care was categorized into: regular care, late (third trimester) care and no prenatal care. Level of education and Medicaid participation were used as markers of socioeconomic status. Maternal obstetric histories were incomplete in nurse case management records and were not considered for the purposes of this study. At the time of this analysis, 0 infant deaths were recorded for program participants in either group; therefore, this outcome was not compared.

Comparisons were made between the mothers who received antepartum home visits versus those who did not receive antepartum home visits with respect to demographic and clinical characteristics. Chi-squared test, Fischer's exact test and independent t tests were used where appropriate. Significant maternal characteristics were included as covariates in the analyses of the association between home visitations and birth outcomes. Logistic regression analysis was used to estimate odds ratios (ORs) for the association of antepartum home visits to low birthweight and preterm delivery. Ninety-five percent (95%) confidence intervals (CI) were computed to estimate the precision of the odds ratio. Statistical significance was determined at an alpha level of 0.05, two-tailed.

RESULTS

The demographic and clinical characteristics of the 21 women excluded from analysis, due to lack of infant birth data, were compared to the demographic and clinical characteristics of the 109 included cases. Women included in the analysis did not differ from the women excluded from analysis with respect to age, education, Medicaid, marital status and referral source. The women excluded from the analysis had a tendency toward less regular prenatal care and had a greater mean number of prior pregnancies and prior live births.

Forty-eight women received antenatal visits, and 61 women did not enter the program until after delivery. Tables 1 and 2 show the maternal demographic and clinical characteristics by group (antepartum visits versus no antepartum visits). There were no significant differences in maternal demographic characteristics between the two groups, including age, education, marital status and insurance. The typical participant was 27 years old, unmarried, high-school educated, receiving Med- icaid and referred by a service agency in the community such as Healthy Start, Child Protective Services or Infants at Risk. Deliveries for women enrolled in the program antepartum included 16.7% preterm deliveries and 14.6% low birthweight, compared with 36.1% and 29.5%, respectively, for deliveries for women who were not enrolled (Table 2). There were significant group differences in the presence of negative life events, level of prenatal care and mean number of previous live births. A

smaller proportion of women who did not receive antepartum home visits received regular prenatal care and had negative life events. These women also had more prior live births compared to women who did receive antepartum home visits. Groups did not significantly differ on the presence of pregnancy risk factors.

The crude ORs for the association between antepartum home visits and the selected adverse pregnancy outcomes (low birthweight and preterm delivery) suggest that antepartum home visits were significantly related to preterm delivery but not significantly related to low birthweight (Table 3). Overall, infants born of mothers who received antepartum home visits were 0.37 (CI 0.15–0.94) times less likely to be delivered preterm compared to mothers who did not receive antepartum home visits. This association remained significant after controlling for level of prenatal care, the presence of negative life events and the mean number of prior live births. Furthermore, when accounting for level of prenatal care, negative life events and number of prior live births, home visits were associated with a 69% OR=0.31, (CI 0.11–0.88) reduction in the odds of preterm delivery, compared to a 63% of reduction in the risk when maternal characteristics were not accounted for.

In sum, there were no demographic differences between the women who received antepartum home vis- its and the women who did not receive antepartum home visits. Home visitation was protective against preterm delivery in the current study, even when accounting for differences in level of prenatal care, negative life events and number of prior live births.

DISCUSSION

Prenatal home visitation programs have been employed for decades in several different settings to improve birth outcomes in select populations. Several randomized controlled trials and epidemiological studies have shown the benefit of nurse home visitation programs in improving prenatal health habits and providing social support, which translated in better birth outcomes in relatively high-risk subpopulations.[8-11] By utilizing best practices methods of nurse case management and home visitation, the current study suggests that Black Babies SMILE demonstrates a positive impact on birth outcomes in African-American women in Montgomery County.

The majority of African-American women giving birth in Montgomery County are older, more educated and wealthier than the women in this program cohort.[4] The rates of preterm delivery and low birthweight were higher in the study cohort than the recorded 2004 Montgomery County rates for African-American/black women.[4] We believe that this means the program cohort has a higher risk of adverse pregnancy outcomes and possible subsequent infant mortality than the general African-American/black population within the county; however, given the small number of participants in each arm of this cohort, further research is needed before drawing this conclusion. Potentially, a subgroup of women who are at a higher risk by virtue of racial group (i.e., black) were not referred to this program because they did not meet social or economic criteria for contact with the agencies that routinely referred women to Black Babies SMILE. Access of higher socioeconomic status African American women appears to be limited by the low-frequency physician referrals to Black Babies SMILE. We believe outreach efforts targeting community providers are needed to improve awareness of the program and its liberal eligibility criteria.

Our study is limited by the use of existing groups participating (or not) in antepartum care. Nevertheless, the sample size was sufficient to demonstrate a statistically significant estimate of effect in preterm delivery; however, it may not have been adequate to detect a statistically significant estimate of effect in low birthweight. Future studies employing random assignment to antepartum home visits versus a control would allow for a more

definitive evaluation of the efficacy of the Black Babies SMILE program. However, lack of randomization is not uncommon in community-based participatory research designs, where the needs and goals of the community drive the research questions,[7] nor is this an uncommon limitation in public health settings, where health service providers are compelled to offer services to all who qualify and request needed services when they are available. An inability to control for the influence of maternal obstetric history (i.e., prior preterm delivery or obstetric complications) is an additional limitation of our study.

Reviews of the epidemiology of preterm deliveries and low birthweight have identified consistent associations between poor pregnancy outcomes and marital status, stressful life events, perceived stress, poor psychological health, lack of family/social support, and tobacco and cocaine use.[12-17] Nurse case managers in the Black Babies SMILE program reported observations that many of their clients were "stressed," and that unmet psychosocial and behavioral needs often impacted clients' abilities to successfully address a range of health-related behaviors, including adherence to regular medical care (personal communications with S. Jackson and N. Williams). While results of this study suggest that the program has a positive impact on preterm delivery, future studies should aim to replicate these findings and to identify which components of the program are responsible for producing the observed effects. Education, support and referrals provided by nurse case managers were not evaluated as individual program components. To truly ascertain the precise effects of the interventions, other factors such as client knowledge, satisfaction, attitudes and behaviors should be assessed. Behaviors that may be of interest are keeping prenatal appointments, adherence to medical recommendations made by clinicians and the level of smoking cessation. Other data important to capture is the correlation between the frequency of home visits or number of referrals and birth outcomes.

Findings from this study of the influence of Black Babies SMILE on pregnancy outcomes in this restricted population are encouraging, suggesting that infants born to high-risk mothers who receive antepartum home visits are at a minimum 63% less likely to be delivered preterm as those born to mothers who did not receive antepartum home visits. The benefits of longer gestational age in this population are known to influence neonatal morbidity and infant mortality. The use of this county-based approach may be beneficial in similar populations. Many programs such as this are rarely formally evaluated. University/community collaboration models hold promise to address this challenge. This study offered the first quantitative evaluation of the impact of Black Babies SMILE on pregnancy outcomes.

In summary, this cohort study shows a protective effect of antepartum participation in Black Babies SMILE on selected pregnancy outcomes from January 2003 through December 2005. Black Babies SMILE's multicomponent approach addresses the recommendations of the Maryland Fetal and Infant Mortality Review (FIMR) Program, which includes improving case management.[18] Future analyses of the program should focus on isolating program components specifically associated with influencing adverse reproductive outcomes in African-American women, including assessment of the cultural appropriateness of the program and the cultural competency of care providers. An effort to evaluate factors that are within the sphere of influence of the program, such as the participants' knowledge, beliefs and behaviors, may also be meaningful. Additional research is needed to address the impact of this program on the long-term objective of reduced infant mortality in African-American women. Wider use of culturally appropriate programs that are sensitive to the unique characteristics of communities impacted by health disparities (i.e., programs similar to Black Babies SMILE) could enhance outpatient obstetric care by addressing psychosocial and behavioral factors that contribute to health outcomes and ultimately impact racial disparities in infant mortality.

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Table 1

Maternal demographic characteristics by antepartum home visitation

Variable	Home Visits (n=48)	No Home Visits (n=61)	P Value
	Count (%)	Count (%)	
Education			
≥ High-school grad	42 (87.5)	54 (88.5)	0.870†
< High School	6 (12.5)	7 (11.5)	
Maternal Nativity			
Foreign born	15 (31.3)	18 (29.5)	0.844†
U.S. born	33 (68.8)	43 (70.5)	
Marital status			
Married	12 (25.0)	18 (29.5)	0.601†
Not married	36 (75.0)	43 (70.5)	
Referral Source			
Service agency	35 (72.9)	43 (70.5)	0.781†
Self/heathcare provider	13 (27.1)	18 (29.5)	
Insurance			
Medicaid	32 (66.7)	37 (60.7)	0.518†
Private/other	16 (33.3)	24 (39.3)	
Age			
Mean (SD)	27.73 (7.8)	26.46 (6.8)	0.366‡
<18 years	2 (4.2)	5 (8.2)	0.423†
18–24	15 (31.3)	17 (27.9)	
25–29	12 (25.0)	17 (27.9)	
30–34	8 (16.7)	13 (21.3)	
≥35 years	11 (22.9)	9 (14.8)	

SD: Standard deviation;

*P value <0.05;

†Chi-squared test;

†† Fischer's exact test;

‡ t test

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Table 2

Maternal clinical characteristics by antepartum home visitation

Variable	Home Visits (n=48)	No Home Visits (n=61)	P Value
	Count (%)	Count (%)	
Gestational Age			
<37 weeks (preterm delivery)	8 (16.7)	22 (36.1)	0.024†*
≥37 weeks	40 (83.3)	39 (63.9)	
Birthweight			
<2,500 g (low birthweight)	7 (14.6)	18 (29.5)	0.066†
≥2,500 g	41 (85.4)	43 (70.5)	
Prenatal Care			
Regular	41 (85.4)	41 (63.9)	0.012†*
None	5 (10.4)	7 (11.5)	
Late	2 (4.2)	15 (24.6)	
Negative Life Events			
≥1	28 (58.3)	22 (36.1)	0.021†*
None	20 (41.7)	39 (63.9)	
Pregnancy Risk Factors			
≥1	18 (37.5)	24 (39.3)	0.844†
None	30 (62.5)	37 (60.7)	
Tobacco Use during Pregnancy			
Yes	3 (6.3)	4 (6.6)	0.948††
No	45 (93.8)	57 (93.4)	
First Pregnancy			
Yes	2 (4.2)	7 (11.5)	0.169††
No	46 (95.8)	54 (88.5)	
No. of prior pregnancies [mean (SD)]	2.21 (1.72)	2.20 (1.74)	0.978‡
No. of prior live births [mean (SD)]	1.02 (1.09)	1.56 (1.25)	0.022‡*

SD: Standard deviation;

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[*] P value <0.05;

[†] Chi-squared test;

[††] Fischer's exact test;

[‡] t test.

Late prenatal care started in third trimester, and regular prenatal care started prior to third trimester.

Table 3

Logistic regression models: effect of antepartum home visits on pregnancy outcomes before (model 1) and after (model 2) adjusting for significant material characteristics

	Outcome	OR (95% CI)
	Preterm Delivery	**Low Birthweight**
Model 1		
Home Visitations		
Yes	0.37 (0.15–0.94)*	0.43 (0.16–1.15)
No	–	–
Model 2		
Home Visitations		
Yes	0.31 (0.11–0.88)*	0.37 (0.12–1.10)
No	–	–
Negative Life Events		
≥1	2.01 (0.79–5.15)	1.16 (0.44–3.07)
None	–	–
Number of Live Births	1.06 (0.73–1.55)	0.81 (0.53–1.24)
Prenatal Care		
None	2.92 (0.76–11.19)	2.17 (0.55–8.67)
Late	0.81 (0.22–3.07)	0.96 (0.25–3.66)
Regular	–	–

CI: Confidence interval; OR: Odds ratio

*P value <0.05.

Late prenatal care started in third trimester, and regular prenatal care started prior to third trimester.