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Racial/Ethnic Differences in Breastfeeding Initiation and Duration Among Low-income, Inner-city Mothers

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Abstract

Objectives—Despite the promotion of breastfeeding as the “ideal” infant feeding method by health experts, breastfeeding continues to be less common among low-income and minority mothers than among other women. This paper investigates how maternal socio-demographic and infant characteristics, household environment, and health behaviors are related to breastfeeding initiation and duration among low-income, inner-city mothers, with a specific focus on differences in breastfeeding behavior by race/ethnicity and nativity status.

Methods—Using data from a community-based, longitudinal study of women in Philadelphia, PA (N=1,140), we estimate logistic regression and Cox proportional hazard models to predict breastfeeding initiation and duration.

Results—Both foreign-born black mothers and Hispanic mothers (most of whom were foreign-born) were significantly more likely to breastfeed their infants than non-Hispanic white women, findings that were partly explained by foreign-born and Hispanic mothers’ prenatal intention to breastfeed. In contrast to previous studies, we also found that native-born black women were more likely to breastfeed than non-Hispanic white women.

Conclusion—Our findings suggest that when poor whites and African Americans are similarly situated in an inner-city context, the disparity in their behavior with respect to infant feeding is not as distinct as documented in national surveys. Breastfeeding was also more common among low-income immigrant black women than white or native-born black mothers.

Keywords

Breastfeeding; Inner-city; Nativity; Race/Ethnicity; SES

Introduction

Breastfeeding confers numerous immunological and developmental benefits for infants (American Academy of Pediatrics (AAP), 1997; Newman, 1995) and its promotion as the

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“ideal” infant feeding method has become an important component of public health campaigns aimed at improving child health in the United States (Freed, 1993). Although about 70% of U.S. mothers reported breastfeeding in 2001 (Ryan, Zhou and Acosta, 2002), this behavior varies considerably by race/ethnic background and social class, reflecting the multi-faceted nature of the decision to breastfeed (Guttman and Zimmerman, 2000). Of particular concern are the notable black-white differences in breastfeeding behavior (Forste, Weiss and Lippincott, 2001; Kurinij, Shiono and Rhoads, 1988; Miller, 2001). For example, Ryan and colleagues found that in 2001 approximately three-quarters of non-Hispanic white and Hispanic mothers reported that they had ever breastfed their infants compared to only about half of African American mothers. Yet, despite these disparities, surprisingly few studies have systematically explored how race/ethnic background and other maternal and household characteristics influence breastfeeding behavior.

This paper provides a detailed examination of breastfeeding practices among low-income, mostly minority, inner-city women. We address the following questions: (1) How does breastfeeding behavior vary by race/ethnicity among low-income, inner-city mothers? (2) What factors account for observed race/ethnic differences in breastfeeding behavior among this disadvantaged group of women? (3) Does breastfeeding intention during pregnancy explain race/ethnic variation in breastfeeding initiation and/or duration? We extend previous research by focusing our lens on socioeconomically disadvantaged women, who are often underrepresented in population-based national surveys and for whom in-depth analysis is rarely conducted because of inadequate sample sizes. We incorporate a wide range of measures of socioeconomic circumstances, social environment, and maternal psychosocial and behavioral characteristics. In addition, we examine the role of maternal participation in two important programs that aim to promote breastfeeding: The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) and the provision of breastfeeding consultation in the birth hospital.

Background

Prior research has consistently shown that breastfeeding rates tend to mirror socioeconomic inequalities such that breastfeeding is most common among highly educated, higher income mothers (Hirschman and Butler, 1981; Ryan, Zhou and Acosta, 2002). Thus, current black-white differences in breastfeeding behavior may at least partly reflect racial disparities in socioeconomic resources. This racial pattern in breastfeeding behavior, however, has not always been the case. Hirschman and Butler (1981), for example, found that black women were more likely to breastfeed than white women until the 1960s–1970s. The authors speculated that the change came about at least partly because of changes in rural-to-urban residence and employment patterns among black mothers. At the same time, the authors found that breastfeeding was closely associated with maternal education and marital status. Recent black-white differences in breastfeeding behavior have also been explained in part by marital status, as the propensity to marry is lower among African American than white women (Bulcroft and Bulcroft, 1993) and breastfeeding rates are significantly higher among married than unmarried mothers (Guzzo and Lee, 2008; Ryan, Zhou and Acosta, 2002). African American mothers also tend to resume employment more quickly after childbirth than white mothers (Browne, 2000), and employment is a documented barrier to sustained breastfeeding (Haider, Jacknowitz and Schoeni, 2003). However, socioeconomic status (SES), including marital status and maternal employment, has typically explained only some of the black-white variation in breastfeeding behavior (Forste, Weiss and Lippincott, 2001; Kurinij, Shiono and Rhoads, 1988; Miller, 2001).

The failure of SES to account for black-white or other race/ethnic differences in breastfeeding behavior suggests a need to explore other factors that may contribute to variation in

breastfeeding along racial and ethnic lines. Although race/ethnicity is associated with socioeconomic stratification in the U.S., women from various race/ethnic backgrounds may also share distinct beliefs and behavioral norms derived from intergenerational patterns (Suchman, 1964; Stein, Fox, and Murata, 1991; Weller and Dungy, 1986). Furthermore, immigrant mothers may particularly hold normative beliefs and follow cultural practices that differ from those of U.S.-born mothers (Guendelman, 1988; Markides and Coreil, 1986). Using nationally representative data, Miller (2001), for example, found that Mexican-Americans had breastfeeding initiation rates similar to whites and that Spanish-speaking Mexican-Americans were significantly more likely to breastfeed than their English-speaking counterparts, even after controlling for SES and other maternal characteristics. Analyzing data from the Fragile Families and Child Wellbeing Study (a survey of mostly unwed mothers and fathers in the U.S.), Kimbro, Lynch and McLanahan (2008) similarly found that Mexican immigrants were more likely to breastfeed than white mothers, but that second-generation Mexican-Americans exhibited breastfeeding behavior largely similar to whites, suggesting that greater acculturation among second-generation immigrant women is associated with a greater propensity to formula feed. Little is known, however, about breastfeeding behavior among African-origin immigrants to the United States, nor do we know much about the breastfeeding practices of non-Mexican Hispanic women.

Conceptual Model

Figure 1 outlines our conceptual model. It draws from social network theory (Pescosolido, 1992) and ecological theories of parenting (Bentley et al., 1999; Brofenbrenner, 1979). These perspectives are especially pertinent to understanding the multi-faceted nature of the mother's decision to breastfeed her infant as both theories emphasize the socially embedded aspects of the decision-making process.

As noted above, race/ethnicity and nativity proxy not only socioeconomic contexts, but also tap into socio-cultural environments that are hypothesized to influence breastfeeding behavior (Suchman, 1964). These contexts include social networks that can serve as important sources of information about health behaviors and beliefs. Socio-cultural orientations rooted in these networks reflect intergenerational transmission of ideas and information, behavioral norms and parenting beliefs held by family and friends, as well as traditional or accepted customs in the countries of origin among immigrants to the United States.

Most central to the mother's social context are her interpersonal relationships with the child's father, family, and friends, who are salient and trusted sources of support, social influence, and information (Baranowski et al., 1983; Bentley et al., 1999; Göksen, 2002; Matich and Sims, 1992; Raj and Pritchard, 1998). These individuals can provide a buffer against material hardships and stress, and they may either encourage or discourage breastfeeding as they shape the norms regarding what infant feeding method is deemed "best." In this light, findings from qualitative research may be particularly relevant. This research has highlighted the potential negative effects of societal taboos against public exposure of breasts on breastfeeding initiation, especially among low-income mothers (Blum, 1999; Guttman and Zimmerman, 2000; Hoddintott and Pill, 1999). Based on this literature, we speculate that women's feelings of embarrassment may be more acute in crowded households where there is little personal privacy. Thus, normative beliefs about whether breastfeeding is "best," together with ideals about body image and sexuality and the symbolic meaning attached to parenting behaviors, inform and reflect the immediate social context in which the decision to breastfeed is made. Although difficult to measure empirically, these beliefs make up a part of cultural "common sense" that is transmitted across generations and re-evaluated through social interactions (Bentley et al., 1999: 1087; Pescosolido, 1992).

In addition to informal sources of support, we hypothesize that more formal institutional sources of information and encouragement form a part of the larger social context in which women make their infant feeding decisions. In the United States, these sources include health care providers, health promotion campaigns, and private and public programs that promote and facilitate breastfeeding. One such public program, particularly relevant for low-income mothers, is the WIC program, which serves as a nutritional safety net for low-income women and infants. Although WIC has placed increasing emphasis on breastfeeding promotion and the provision of nutritional support to breastfeeding mothers (Schwartz et al., 1995), it continues to provide free infant formula, which may indirectly discourage breastfeeding. Health care providers, in turn, can disseminate information about the beneficial effects of breastfeeding and in recent years, an increasing number of hospitals have initiated “baby-friendly” programs to instruct mothers on how to overcome initial difficulties associated with nursing (Freed, 1993). Both participation in WIC and being open to breastfeeding consultation in the birth hospital are likely to attract women who are predisposed to a certain infant feeding method, suggesting that there is a bidirectional relationship between participation in these programs and infant feeding decisions.

In addition to social environment and cultural context, our conceptual model incorporates several demographic and socioeconomic factors that may be correlated with race/ethnicity and are also known to be independently associated with breastfeeding, such as maternal age, education, income, and employment (Hirschman and Butler, 1981; Peterson and DaVanzo, 1992; Roe et al., 1999). For example, prior studies have shown that higher maternal education is an important determinant of breastfeeding, perhaps because education signals greater knowledge of breastfeeding benefits or represents different socialization processes. Along with maternal education, the education of the child’s father is likely to be influential for the mother’s decision regarding whether or not to breastfeed. More educated fathers, like more educated mothers, are likely to have greater awareness of the beneficial effects of breastfeeding and educated fathers may be more willing to provide encouragement and support for a breastfeeding mother.

Other maternal characteristics, which are hypothesized to influence infant feeding decisions, include her psychosocial well-being, physical health, and health behaviors (Forste, Weiss and Lippincott, 2001). Poor psychosocial health may indicate stressful life circumstances that make breastfeeding difficult and poor physical health of the mother may render breastfeeding impossible (Chung et al., 2004). Health behaviors, such as smoking, may also influence the mother’s decision to breastfeed, because a mother who smokes may fear “passing” harmful substances, such as nicotine, to her child (Guttman and Zimmerman, 2000). In addition to maternal well-being, child-related factors, such as the child’s birth order, health status, appetite and temperament, may influence breastfeeding decisions (Bentley et al., 1999).

Finally, the model incorporates breastfeeding intention during pregnancy as a critical determinant of breastfeeding initiation and duration. Behavioral intentions are among the strongest predictors of future behavior (Fishbein and Ajzen, 1975) and intention to breastfeed often reflects high degrees of normative and attitudinal support for breastfeeding (Göksen, 2002). Little prior research, however, has examined the extent to which race/ethnic and other subgroup differences in breastfeeding behavior are conditioned by differing breastfeeding intentions.

Data and Methods

Sample

We use data from a prospective, longitudinal study of inner-city, low-income women conducted in Philadelphia, Pennsylvania. Women were enrolled into the study between

February 2000 and November 2002 at the time of their first prenatal care visit at Philadelphia Department of Public Health District Health Centers located throughout the city. English and Spanish-speaking women were eligible to participate. The study was designed to investigate race/ethnic differences in infant and child health, with emphasis on the role of maternal stress and neighborhood context. Using structured questionnaires, trained female interviewers collected detailed information on socio-demographic characteristics, household structure, health behaviors, maternal health, housing and neighborhood conditions, the mother's relationship with the child's father and other partners, and infant and child health, including information on breastfeeding (Chung et al., 2006; 2008).

The first interview took place at the time of the mother's first prenatal care visit with three follow-up interviews conducted postpartum. Of the 2,374 women eligible for the study, 98.2% (2,332) consented to participate of whom 85% (1,984) were known to have a live birth, 7% had a stillbirth, miscarriage, abortion, or an ectopic pregnancy, and for about 8% the birth outcome was unknown. Of the 1,984 live births, approximately 85% of the mothers lived with their child and were interviewed at least once during the postpartum period. Seventy-three percent (1,456) of the women who had a live birth were living with the child and completed the first partum interview, and of these women 78% (1,143) completed the second postpartum interview. An additional 179 women who did not complete the first postpartum interview completed the second postpartum survey.¹

In this paper, we use data from the prenatal interview (wave 1) and two postpartum interviews (waves 2 and 3) when the children were on average 3.4 months (SD = 1.35; wave 2) and 11.1 months (SD = 1.30; wave 3) old. A total of 1,322 women, who had a live birth and who were living with their child at the time of the first and second postpartum interviews, completed the surveys. We then restricted the sample to women who gave birth at ages 18 and above. Mothers below age 18 (N=125) were excluded because the decision-making process regarding infant feeding is likely to differ for very young mothers (Peterson and DaVanzo, 1992). We also dropped women of Asian ethnicity and "other race" individuals due to small numbers (N=38), and women who were missing information on breastfeeding initiation or duration (N=19). Based on these exclusion criteria, the final sample consisted of 1,140 women.² When compared to all Philadelphia women giving birth in 2001, our study women were younger, had lower levels of education, and they tended to live in more disadvantaged areas of Philadelphia. These differences were more pronounced among non-Hispanic white women than among African American or Hispanic women (results not shown).

Dependent Variables

Our dependent variables are breastfeeding initiation and breastfeeding duration. Most studies have classified a woman as initiating breastfeeding if she reported having "ever breastfed." In contrast, we consider that the mother initiated breastfeeding only if she reported having breastfed for at least one week (Starbird, 1991). We believe that this latter coding is a more accurate indicator of true breastfeeding initiation. Not surprisingly, a higher percentage of women reported having ever breastfed (59%) than for breastfeeding for at least one week (48%). Our conclusions, however, are not affected by this definitional choice (results not shown).

Breastfeeding duration is examined among those women who initiated breastfeeding (N=553). Information on duration is based on data from survey waves 2 and 3 when women were asked

¹Information was collected from these women using a special survey questionnaire that combined questions from the first two postpartum interviews. Included in the instrument were questions about infant feeding behavior.

²Observations with missing values (<1%) were recoded to the mean. Because the number of missing cases is extremely small, this decision does not alter our conclusions.

to report the length of time they breastfed the index child. Because roughly 14% of the mothers were still breastfeeding at wave 3 (N=75), breastfeeding duration was censored at 8 months for these respondents -- the youngest age of children at the time of the wave 3 interview.

Independent Variables

Our explanatory variables tap into various dimensions of our conceptual framework outlined earlier. Race/ethnicity and nativity status, our key characteristics of interest, were categorized into five distinct subgroups: non-Hispanic whites (10%), non-Hispanic native-born African Americans (64%), foreign-born blacks (primarily African and Caribbean immigrants) (8%), Puerto Ricans (9%), and other Hispanic mothers (Mexican, Central and South American women) (9%) (Table 1). We distinguished between the native and the foreign-born only among African-origin mothers because of a significant interaction between nativity status and African origin. The non-Hispanic white mothers were mostly native-born (92%), other Hispanic mothers were largely foreign-born (86%), and most Puerto Rican women were born in the mainland U.S. (67%).

We also included several measures of maternal SES that capture nuances in economic conditions among this low-income population. These included welfare receipt in the year prior to the first prenatal care visit in the analyses of breastfeeding initiation and postpartum welfare receipt in the analyses of breastfeeding duration, housing stability before or after birth based on information on homelessness and frequency of moves, and a lack of material assets (whether the mother had a checking account and/or working credit card). Because the association between household income and breastfeeding behavior was insignificant, income was dropped from the analysis. We also incorporated maternal education and pre- and postnatal employment.

As an indicator of the mother's relationship status with the infant's father, we combined information on current relationship type and expectations of future marriage prospects measured at the time of the prenatal interview for the breastfeeding initiation analyses and postpartum interview for the breastfeeding duration analyses. We also controlled for the father's educational attainment, which we hypothesized to capture aspects of social support/environment as well as the SES of married and cohabiting mothers. Although maternal and paternal education levels were positively correlated, the correlation coefficient was reasonably small ($r^2=0.34$). As a proxy for maternal kin's social influence, we included the presence of the infant's maternal grandmother in the home at the time of the first postpartum interview in the analyses of breastfeeding duration. In addition, we examined whether the mother's perception of privacy in the home – having enough space vs. having some or no private space – was associated with breastfeeding initiation and duration. Our two program variables were dichotomous indicators of WIC use during pregnancy or postpartum and whether the mother had contact with a nurse or lactation consultant in the birth hospital.

We used pre-pregnancy and postpartum body mass index (BMI) as measures of maternal health. Maternal obesity ($BMI \geq 30$) has been linked to a reduced likelihood of breastfeeding initiation and shorter periods of nursing (Donath and Amir, 2000). We also included measures of prenatal and postpartum depressive symptomatology based on the Center for Epidemiological Studies Depression Scale (CES-D), smoking during pregnancy or after birth, and late (third trimester) entry into prenatal care. Child-specific factors consisted of birth order and the infant's health at birth – whether the infant was born low birthweight (<2500 grams) or went to a neonatal intensive care unit (NICU) after delivery.

Finally, we used a dichotomous indicator of the mother's breastfeeding intention reported at the time of her first prenatal care visit, conceptualized as perhaps the most important mediating

variable. As noted earlier, breastfeeding intention is likely to reflect a confluence of family history, social norms, knowledge, and beliefs about the importance of breastfeeding.

Methods

We used logistic regression to examine associations between the explanatory variables and breastfeeding initiation (Hosmer and Lemeshow, 1989). Results are presented as odds ratios (OR), where odds ratios greater than one indicate an increased likelihood and odds ratios less than one indicate a decreased likelihood of breastfeeding initiation relative to the reference category.

We modeled breastfeeding duration using Cox proportional hazard model with the risk of weaning as the dependent variable. The results are presented in the form of hazard ratios, or relative risks (RR), calculated from coefficients obtained from the model ($RR=e^{\beta}$). Hazard ratios greater than one indicate an increased risk of terminating breastfeeding and hazard ratios less than one indicate a reduced risk of weaning relative to the reference category. All models were estimated with STATA 10. Standard errors were corrected for clustering at the health center where the mother received prenatal care to adjust for potential non-independence among women who obtained prenatal care in the same health center.

We first examined the bivariate associations between the explanatory variables and breastfeeding initiation and duration. Only those characteristics that exhibited a significant bivariate association ($p < 0.10$) were included in the multivariate models. We report results from five nested models. The baseline model, Model 1, examines the relationship between race/ethnicity and immigrant status and breastfeeding initiation or duration only. Model 2 adds maternal socio-demographic characteristics. Model 3 introduces controls for household environment and health behaviors. Model 4 incorporates maternal breastfeeding intentions, and Model 5 adds programmatic variables. Two-way interactions among all possible combinations of control variables in the multivariate models were tested. Apart from the interaction between race/ethnicity and nativity discussed earlier, no other significant interactions were detected (results not shown).

Results

Sample Characteristics

Table 1 presents the sample characteristics. About 48% of the mothers initiated breastfeeding for at least one week. Among breastfeeding women who had weaned by the second postpartum interview, the mean duration of breastfeeding was 11.3 weeks ($SD = 11.0$ weeks) or about 2.6 months. Fourteen percent of the women who initiated breastfeeding were still breastfeeding at the time of the second postpartum interview. Our sample consists mainly of relatively young, non-Hispanic black, native-born mothers. Less than 20% of the women had education beyond high school, two-thirds did not have a checking account or a credit card, and close to 20% had been homeless or had moved frequently in the year prior to their first prenatal care visit. Yet only about one in five women reported receiving public assistance around the time of their first prenatal interview. Forty-three percent of the women were first time mothers and about 17% of the infants were born low birthweight or went to the NICU after delivery.

Less than 25% of the women were married or were cohabiting with the child's father during pregnancy, and close to a quarter of the fathers were known to have less than a high school education. About one-quarter of the women reported smoking during pregnancy, and about 35% showed signs of possible or probable depression based on the CES-D. Over 80% of the mothers reported that they received WIC, either during pregnancy or after birth. In addition, about 3 in 4 women stated that a nurse/lactation consultant had either talked with them or

assisted them with nursing in the birth hospital. Finally, about half of the study mothers indicated during pregnancy that they intended to breastfeed their child.

Breastfeeding Initiation

Unadjusted odds ratios for breastfeeding initiation are presented in the third column of Table 1. Consistent with previous studies, we found substantial race/ethnic and nativity differences in breastfeeding initiation. Both foreign-born black and Hispanic mothers, most of whom were also foreign born, were much more likely to breastfeed than non-Hispanic white women. In contrast to other studies (Forste, Weiss and Lippincott, 2001; Kimbro, Lynch and McLanahan, 2008; Miller, 2001; Ryan, Zhou and Acosta, 2002), native-born African American women were also significantly more likely to breastfeed than white women.

We also documented significant associations ($p < 0.10$) between breastfeeding initiation and several other explanatory variables. For example, higher levels of maternal schooling and having a working credit card and/or checking account exhibited significant positive associations with breastfeeding initiation whereas receiving public assistance and unstable housing were related to reduced likelihoods of breastfeeding. In addition, higher levels of father's education and being in a marital/cohabiting relationship with the infant's father were associated with higher levels of breastfeeding initiation. Of the two program variables, only contact with a lactation consultant in the hospital was a significant, positive predictor of breastfeeding initiation. We also found that women who reported smoking during pregnancy were significantly less likely to breastfeed. Furthermore, as expected, those who reported during pregnancy that they intended to breastfeed were much more likely to do so. No other explanatory variables exhibited a significant bivariate association with breastfeeding initiation and they were excluded from the multivariate analyses shown in Table 2.

The race/ethnic differences in breastfeeding initiation remained largely unchanged with the introduction of sociodemographic controls (Model 2). Adjustment for social support, social environment, and maternal smoking during pregnancy (Model 3) attenuated the race/ethnic and nativity differentials somewhat but they remained substantial. The introduction of breastfeeding intention (Model 4) led to the largest reduction in the foreign-born black and Hispanic coefficients, although their significant associations with breastfeeding initiation remained sizable. Interestingly, the negative coefficient for Puerto Rican mothers became larger and statistically significant after adjusting for women's intention to breastfeed. This is, in large part, driven by the fact that Puerto Rican mothers were more likely to indicate that they planned to breastfeed than white mothers during pregnancy, but were less likely to follow through on their stated intention. The native-born non-Hispanic black and non-Hispanic white differential in breastfeeding initiation was also attenuated, and was no longer statistically significant in Model 4 ($p = 0.2$). Adjustment for contact with a lactation consultant in the birth hospital did little to explain the remaining race/ethnic differentials (Model 5).

In addition to race/ethnicity, maternal and paternal education remained significant predictors of breastfeeding initiation in all models, with higher levels of schooling predicting a greater likelihood of breastfeeding initiation. Receipt of public assistance and unstable housing did not remain statistically significant in the multivariate models, and our indicator of material assets (whether the mother had a checking account/credit card) was no longer significant once breastfeeding intention was accounted for.

Consistent with expectations, we also found that women who smoked during pregnancy were only about half as likely to initiate breastfeeding as non-smokers, independent of other explanatory variables. In addition, women who interacted with a nurse/lactation consultant in the birth hospital were twice as likely to initiate breastfeeding as other women (Model 5). This result was robust to controls for a woman's prenatal breastfeeding intention, which was the

most important predictor of breastfeeding initiation – women who reported that they intended to breastfeed were 7.7 times more likely to do so than women who did not plan to breastfeed.

Breastfeeding Duration

We analyzed predictors of breastfeeding duration among the subgroup of women who initiated breastfeeding (see Table 1). We documented several significant unadjusted and adjusted associations between breastfeeding duration and the explanatory variables. Both Hispanic women and foreign-born black women breastfed for longer durations than other women, although the differences were significant only for the foreign-born black women in Models 1 and 2 (Table 3). In addition, Puerto Rican mothers were significantly more likely to wean at shorter durations than other women, a result that retained statistical significance in all multivariate models.

We further found that older women breastfed for significantly longer durations than younger women, while first-time mothers were at increased risk of early termination. However, among the demographic controls, only maternal age retained a significant association with breastfeeding duration in the adjusted models. Other significant predictors in both bivariate and multivariate models included welfare receipt after birth, poor infant health, relationship status, adequate privacy/space in the home, smoking after the child's birth, breastfeeding intention, and WIC program participation. Women who received public assistance after the child's birth, women who gave birth to infants in fragile health (low birthweight or NICU transfer), and women who did not have enough privacy/space in the home or smoked after the child was born were at an increased risk of earlier weaning. In contrast, mothers in marital or cohabiting relationships, women whose prenatal intention was to breastfeed and those who did not use WIC services after the child's birth breastfed for longer durations than other women (Table 3).

Discussion and Conclusion

Low-income, urban women comprise an important “at risk” target population for public health and educational efforts aimed at increasing breastfeeding initiation and duration in the United States. The purpose of this paper was to investigate the associations between race/ethnicity, socioeconomic characteristics, household environment, infant health and health behaviors and breastfeeding initiation and duration among low-income, mostly minority, inner-city mothers. A better understanding of factors that contribute to the variation in breastfeeding behavior in this population can aid in the development of more effective strategies to promote breastfeeding.

We found that foreign-born black women and Hispanic women, most of whom were also foreign born, were more likely to initiate breastfeeding than non-Hispanic white women or native-born, non-Hispanic African American women. The positive association between immigrant status and breastfeeding initiation has been previously documented in national surveys (Forste, Weiss and Lippincott, 2001; Kimbro, Lynch and McLanahan, 2008; Miller, 2001). This higher propensity to breastfeed among foreign-born blacks and Hispanics was not explained by SES, household environment, or maternal health and health behaviors. Higher prenatal breastfeeding intentions among immigrant women partly accounted for the foreign-born/native-born differences, but they remained large and significant. We speculate that nativity status reflects broad socio-cultural differences between native-born and foreign-born mothers, differences that we could not fully capture. Breastfeeding may be a practice that is socially embedded in immigrant mothers' parenting beliefs that are retained upon immigration to the United States. We suspect, as has been hypothesized in other studies (Forste, Weiss and Lippincott, 2001; Kimbro, Lynch and McLanahan, 2008), that the low-income immigrant mothers come from families and communities where breastfeeding is the predominant infant

feeding method. In contrast, among low-income populations in the United States, formula feeding is common and socially accepted. The above differentials, however, were limited to breastfeeding initiation and were not found for breastfeeding duration.

At the same time, contrary to expectations, we found that Puerto Rican mothers were less likely both to initiate breastfeeding and to breastfeed for shorter durations than other women. . Furthermore, native-born non-Hispanic black women were significantly more likely to initiate breastfeeding than non-Hispanic white women; this difference was not evident for breastfeeding duration. The difference in breastfeeding initiation between non-Hispanic white and non-Hispanic, native-born black mothers was largely explained by household environment, smoking, and prenatal intention to breastfeed. We attribute this finding to the fact that the non-Hispanic white women in our study were a select group of underprivileged white women who were remarkably similar in their SES characteristics to the native-born black women (results not shown). Our findings thus suggest that when white and native-born African American mothers are similarly situated in an inner-city context, their behavior with respect to infant feeding is not as distinct as that found in national samples.

We also documented independent effects of SES on breastfeeding initiation (educational attainment) and duration (receipt of public assistance), results that are similar to those of prior studies (Forste, Weiss and Lippincott, 2001; Kurinij, Shiono and Rhoads, 1988; Miller, 2001; Ryan, Zhou and Acosta, 2002). Particularly notable were the associations between maternal and paternal education and breastfeeding initiation. Education thus appears to be an important determinant of breastfeeding initiation, even among this group of disadvantaged women, and appears to be independent of health behaviors and prenatal breastfeeding intentions. That paternal education exhibited an independent association with the mother's decision to initiate breastfeeding points to the potentially important role fathers can play in encouraging breastfeeding. Educational attainment may proxy awareness of the benefits of breastfeeding as well as social acceptance. These associations, however, were limited to the initial decision of whether or not to breastfeed. Neither maternal nor paternal education was a significant predictor of breastfeeding duration.

Our hypothesis that the social environment influences the mother's breastfeeding decision was also partly supported. Women in more stable relationships with the child's father were more likely to breastfeed and to do so for longer durations. These results are consistent with previous findings showing that breastfeeding is more common among married and cohabiting women than among unmarried, non-coresidential mothers (Guzzo and Lee, 2008). Our results also lend tentative support to the idea emerging from qualitative research that perceptions of privacy influence breastfeeding behavior among low-income women (Blum, 1999; Guttman and Zimmerman, 2000). Although women's perception of privacy or space in the home was unrelated to breastfeeding initiation, it was a significant predictor of breastfeeding duration such that mothers who felt that they did not have enough privacy or space in the home breastfed for shorter durations. This finding is not altogether surprising given the need for personal space and time for a nursing mother.

Results relevant for programmatic interventions relate to contact with lactation consultants in the birth hospital and maternal participation in the WIC program postpartum. We found that personal interaction with a nurse/lactation consultant following childbirth was a significant predictor of breastfeeding initiation, although this result must be viewed with caution. It is quite possible that women who engaged in such interactions were selective of those predisposed to breastfeeding. However, the fact that we found a significant association between breastfeeding initiation and contact with a nurse/lactation consultant even after controlling for prenatal breastfeeding intention provides some support for the notion that the provision of lactation consultation to mothers shortly after childbirth increases breastfeeding at least in the

first week following delivery. However, the influence of such interaction appears at best to be short term as it did not exhibit a significant association with breastfeeding duration.

In addition, the use of WIC services during the postpartum period exhibited a significant negative association with breastfeeding duration, a finding that was robust to adjustment for other explanatory variables, including women's prenatal breastfeeding plans. This result suggests that the WIC program may be sending mixed messages to low-income mothers as it tries to encourage breastfeeding while simultaneously providing free infant formula. Although we could not directly examine the role of WIC breastfeeding counseling, our findings suggest that the influence of WIC on infant feeding practices merits further exploration. Our results also point to the importance of promoting smoking cessation, as women who smoked prior to pregnancy or after delivery were significantly less likely to initiate breastfeeding and to wean their infants earlier than non-smokers.

Finally, we highlight the central role that breastfeeding intentions play in understanding breastfeeding initiation and duration patterns. Our results suggest that the decision to breastfeed is made prior to the birth of the child and that the prenatal period is an opportune time for programmatic interventions designed to promote breastfeeding.

We must also note several limitations. First, our study participants were not representative of all Philadelphia mothers. Women who seek prenatal care from public health centers are low-income, mostly minority women, who live in disadvantaged Philadelphia neighborhoods. However, relatively little is known about factors that are associated with breastfeeding behavior among low-income, inner-city mothers. Breastfeeding materials and counseling aimed at low-income women often emphasize the health and nutritional benefits of breast milk, a message that has been widely disseminated (Guttman and Zimmerman, 2000). Yet breastfeeding rates remain low, perhaps because breastfeeding, like other health behaviors, is embedded within sociocultural contexts and mores, and promotional efforts that focus simply on increasing knowledge about the nutritional benefits of breast milk may be of limited efficacy.

Although we identified several factors that explain variation in breastfeeding behavior among disadvantaged inner-city mothers, data limitations restricted our ability to measure all aspects of our conceptual framework. For example, we were unable to explore attitudes and beliefs about breastfeeding and the role of informal social networks in the mother's infant feeding decision, factors that merit further investigation (Göksen, 2002; Matich and Sims, 1992; Raj and Pritchard, 1998). In addition, lack of information on the precise timing of maternal employment postpartum made it impossible to adequately model how return to work influenced women's breastfeeding behavior. A better understanding of what role maternal employment and welfare-to-work requirements play in low-income women's decisions to breastfeed would seem to be particularly important and timely given the changes in public provision of financial support to poor women (Haider, Jacknowitz and Schoeni, 2003).

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Figure 1.
Conceptual Model for Breastfeeding Behavior

TABLE 1

Sample Characteristics and Unadjusted Associations with Breastfeeding Initiation and Duration, Longitudinal Study of Low-Income Philadelphia Mothers and their Children

	Breastfeeding Initiation		Breastfeeding Duration	
	% of Initiation Sample N=1,140	Bivariate Odds Ratio	% of Duration Sample N=553	Bivariate Hazard Ratio
<i>Breastfeeding Behavior</i>				
Breastfed one week or longer	48.5			
Mean duration in weeks (standard deviation) ^a			11.3 (11.0)	
<i>Race/Ethnicity & Nativity^b</i>				
Non-Hispanic white	10.0	---	7.4	---
Non-Hispanic native-born black	64.2	1.43***	58.9	1.08
Foreign-born black	8.3	6.68***	13.6	0.75**
Puerto Rican	8.7	0.77	5.4	1.55**
Other Hispanic	8.8	7.59***	14.7	0.76
<i>Demographic, Socioeconomic & Child Factors</i>				
Maternal age at birth ^c				
18–19	17.3	0.77	15.2	1.15
20–24	43.5	---	44.1	---
25 or older	39.2	1.05	40.7	0.65**
Mother's education ^b				
< High school	33.6	---	26.2	---
High school/GED	47.5	1.61***	48.5	0.95
Beyond high school	18.9	3.06***	25.3	0.82
Maternal employment ^d				
Worked	36.0	1.12	25.5	1.15
Looking for work	31.0	0.87	22.5	1.04
Did not work	33.1	---	52.0	---
Has checking account or working credit card ^b				
Yes	32.0	1.55***		
No	68.0	---		
Public assistance (cash) receipt ^d				
Received assistance	18.5	0.59**	35.8	1.38***
Did not receive assistance	81.5	---	64.2	---
Unstable housing (homeless & frequency of moves) ^d				
Never homeless & moves infrequently	82.0	---	82.5	---
Ever homeless or moves frequently	18.0	0.82†	17.5	1.02

	Breastfeeding Initiation		Breastfeeding Duration	
	% of Initiation Sample N=1,140	Bivariate Odds Ratio	% of Duration Sample N=553	Bivariate Hazard Ratio
Birth order ^b				
First birth	43.3	1.19	45.6	1.30*
Second birth or higher	56.7	---	54.4	---
Poor infant health at birth ^c				
Normal birthweight & did not go to NICU	82.7	---	84.3	---
Low birthweight or went to NICU	17.3	0.81	15.7	1.20*
Social Environment				
Father's education ^c				
< High school	22.7	---	19.0	---
High school/GED	50.0	1.34*	49.2	0.90
Beyond high school	19.1	2.80***	25.9	0.85
Don't know/missing	8.2	0.81	6.0	1.20
Relationship status with baby's father ^d				
Married/cohabiting	23.0	1.90**	51.0	0.67***
Not married/cohabiting, good chance of marriage	33.3	1.21	9.4	0.70
Not married/cohabiting, little chance of marriage	43.8	---	13.9	---
No longer in relationship ^c			25.7	0.88
Perceptions of privacy/space in home ^d				
Enough privacy	77.3	---	75.6	---
Some or no privacy or space	22.7	1.16	24.4	1.17†
Baby's maternal grandmother lives in home ^c				
Yes			24.2	1.24
No			75.8	
WIC Receipt ^d				
Used WIC	83.5	---	90.9	---
Did not use WIC	16.5	1.22	9.1	0.77†
Nurse/Lactation cons. talked/helped R. breastfeed ^c				
Yes	75.1	1.95**	81.4	0.97
No	24.9	---	18.6	---
Maternal Well-being & Behavioral Factors				
Body mass index (BMI) ^d				
Underweight (BMI <18.5)	5.0	1.17	2.2	0.90
Normal or overweight (BMI 18.5–30)	70.8	---	62.4	---

	Breastfeeding Initiation		Breastfeeding Duration	
	% of Initiation Sample N=1,140	Bivariate Odds Ratio	% of Duration Sample N=553	Bivariate Hazard Ratio
Obese (BMI ≥ 30)	24.2	1.27	35.4	1.06
Depressive symptomology, CES-D Scale ^d				
Not depressed (Score <16)	64.2	---	71.1	---
Possibly depressed (Score 16 to 22)	14.7	0.91	12.7	1.35*
Probably depressed (Score 23+)	21.1	0.99	16.3	1.10
Late entry into prenatal care ^b				
Entered first or second trimester	91.8	---	92.6	---
Late entry (third trimester)	8.3	0.81	7.4	1.10
Current smoker ^d				
Yes	25.2	0.36***	22.6	1.36**
No	74.8	---	77.4	---
Breastfeeding Intention during Pregnancy^b				
Did not intend	49.6	---	23.2	---
Intended to breastfeed	50.4	9.67***	76.9	0.67***

^a Measured among women who initiated breastfeeding (48.5% of entire sample).

^b This information was assessed at the prenatal interview (wave 1).

^c This information was assessed at the first postpartum interview (wave 2).

^d Measured at first prenatal interview (wave 1) for breastfeeding initiation sample and at the first postpartum interview (wave 2) for breastfeeding duration sample.

[†] $p < 0.10$;

* $p < 0.05$;

** $p < 0.01$;

*** $p < 0.001$ (standard errors corrected for clustering at prenatal health center).

Notes: Percentage distributions may not add up to 100.0 due to rounding. Reference category denoted by ---.

TABLE 2
Odds Ratios from Logistic Regression Models Predicting Breastfeeding Initiation (N=1,140)

Independent Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Race/Ethnicity & Nativity (Non-Hispanic white)					
Non-Hispanic, native-born black	1.43***	1.47***	1.32 [†]	1.20	1.10
Foreign-born black	6.68***	6.00***	4.56***	3.08***	2.81***
Puerto Rican	0.77	0.88	0.73	0.57*	0.57*
Other Hispanic	7.59***	8.97***	7.16***	4.11***	4.31***
Demographic & Socioeconomic Factors					
Mother's education (< High school)					
High school/GED		1.65***	1.44***	1.43***	1.40**
Beyond high school		2.57***	1.91***	1.61**	1.61**
Has checking account or credit card (No)		1.37**	1.22*	1.12	1.10
Received public aid 12 mo. prior to pregnancy (No)		0.81	0.89	1.00	0.94
Unstable housing before birth (No)		0.99	1.08	1.00	1.02
Social Environment & Maternal Well-being Factors					
Relationship status w/father (Not married/cohabiting, little chance of marriage)					
Married/cohabiting			1.30	1.03	1.02
Not married/cohabiting, good chance of marriage			1.16	1.06	1.06
Father's education (< High school)					
High school/GED			1.35**	1.23*	1.21 [†]
Beyond high school			2.18***	2.20***	2.13***
Don't know/missing			1.05	1.28	1.21
Smoked during pregnancy (No)			0.53***	0.63**	0.63***
Breastfeeding Intention (Did not intend)				7.79***	7.69***
Institutional Support					
Interacted with a nurse/lactation consultant in the birth hospital (No)					2.00***
-2 log pseudo likelihood	735.7	713.9	695.8	588.3	580.4

Independent Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Degrees of Freedom	4	9	15	16	17

[†] p<0.10;
* p < 0.05;
** p < 0.01;
*** p < 0.001 (standard errors corrected for clustering at prenatal health center).
Note: Omitted category in parentheses.

TABLE 3
Hazard Ratios from Cox Proportional-Hazard Models Predicting Breastfeeding Termination (N=553)

Independent Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Race/Ethnicity & Nativity (Non-Hispanic white)					
Non-Hispanic, native-born black	1.08	0.96	1.00	0.97	0.97
Foreign-born black	0.75**	0.81*	0.86	0.85	0.85
Puerto Rican	1.55**	1.40**	1.44**	1.40**	1.39*
Other Hispanic	0.76	0.79	0.83	0.84	0.83
Demographic & Socioeconomic Factors					
Age at birth (20–24)					
18–19		1.04	1.06	1.07	1.08
25 and older		0.70**	0.71**	0.74*	0.73*
Second birth or higher (First birth)		1.11	1.10	1.11	1.11
Received public aid after birth (No)		1.26**	1.16*	1.17*	1.16*
Poor infant health at birth (Normal weight and child did not go to NICU)		1.23*	1.26**	1.25**	1.27**
Social Environment & Maternal Well-being Factors					
Relationship status w/father (Not married/cohabiting, little chance of marriage)					
Married/cohabiting			0.80*	0.79*	0.79*
Not married/cohabiting, good chance of marriage			0.73†	0.74†	0.74
No longer in relationship			0.91	0.91	0.88
Not enough privacy/space in home (Enough space)			1.18†	1.18†	1.18*
Depressive symptomology (Not depressed)					
Possibly depressed			1.28	1.30†	1.29
Probably depressed			1.03	1.01	1.02
Smoked after birth (No)			1.24*	1.20†	1.24*
Breastfeeding Intention (Did not intend)					
Did not intend				0.78**	0.78*
WIC Program Participation					
Did not use WIC after birth (Used WIC)					0.72**

Independent Variables	Model 1	Model 2	Model 3	Model 4	Model 5
−2 log pseudo likelihood	2673.8	2660.3	2653.4	2650.8	2648.9
Degrees of Freedom	4	9	16	17	18

[†] p<0.10;
* p < 0.05;
** p < 0.01;
*** p < 0.001 (standard errors corrected for clustering at prenatal health center).
Note: Omitted category in parentheses.