Race and Residential Disparities in the Health Outcomes of Infants Born to Teen Mothers

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INTRODUCTION

Recent reports from the National Center for Health Statistics reveal that birth rates in the United States declined for all teen age groups in all states during the past decade (Ventura, Mathews, and Hamilton 2002). Despite this positive trend, when teen birth rates are compared across nations, the United States lags far behind other developed countries (Singh and Darroch, 2000). Furthermore, on measures of infant health (i.e., low birth weight, infant mortality), the United States performs poorly compared to other developed nations (Population Reference Bureau 2003). While rates of teenage childbearing and poor infant health are disturbing as separate phenomena, convincing evidence also exists that our high rate of teenage childbearing contributes to our elevated rates of poor infant health: experiencing a teenage birth has been shown to have a negative impact on the short and long term health and development of children (Corcoran 1998; Cooper, Leland, and Alexander 1995; Hoffman 1998).

Prior studies investigating the relationship between teen childbearing and child health conclude that both biological (immature reproductive system, low weight gain during pregnancy) and social (poverty, social support, race) factors contribute to poor infant health outcomes for teen mothers (Roth, et al. 1998). Considerable race/ethnicity and residential location disparities in this outcome exist for both the incidence of low birth weight status and the longer term health outcomes associated with low birth weight. Racial and ethnic minority groups and those from disadvantaged central city and nonmetro areas often face common threats to poor infant health outcomes (low maternal education, inadequate pre natal care, increased rates of smoking, see Finch, 2003). Although research attention has been paid to racial and ethnic variation in infant health outcomes, far less has been paid to residential variation in these outcomes or how

race/ethnicity and residence interactions impact infant health outcomes among both teen and older motehrs. Our study explores these associations.

The empirical association between teen childbearing and poor infant health outcomes is the main focus of this study. Specifically, we use data from the National Study of Family Growth (NSFG) to examine the link between maternal age at birth and two infant health outcomes: low birth weight and preterm birth. Our study also emphasizes racial/ethnic and residential (rural/urban) disparities in the health outcomes of infants born to teen mothers by asking the following questions: (1) Do race/ethnicity and residential location mediate the association between teen childbearing and poor infant health? And, (2) do race/ethnicity and residential location moderate the effect of teen childbearing? In other words, does the association between teen childbearing and poor child health differ between non-Hispanic white, non-Hispanic black, and Hispanic respondents? Does the association differ based upon whether the child is born in a central city, suburban, or nonmetropolitan area?

TEEN PREGNANCY AND CHILD HEALTH AT BIRTH

Public concern regarding the consequences of teen pregnancy, for mother, child, and society-at-large has been studied and debated since the late 1960s (Furstenberg 2003). Among the many concerns expressed for the well-being of children born to teenage mothers is the persistent worry regarding their health and development. These concerns are well-founded, as strong evidence exists that children born to teen mothers are more likely to be born low birth weight and/or preterm, and to die before the age of one (Corcoran 1998; Cooper, Leland, and Alexander 1995; Fraser, Brockert, and Ward 1995; Ketterlinus, Henderson, and Lamb 1990;

Parks and Arndt, 1990; Rees, Lederman, and Kiely 1996; Reichman and Pagnini 1997). Furthermore, children born to teen mothers experience a greater risk of health and developmental problems as they age, in part because of the long-term consequences associated with poor health at birth, including mental retardation, psychomotor problems, subnormal growth, learning disabilities, blindness, and deafness (e.g., Hack, et al 2002; Hack, Klein and Taylor 1995; Klein, Stein, and Susser 1989), but also because of the social and psychosocial disadvantages surrounding adolescent mothers' and their children (Angel and Angel 1993; Corcoran 1998).

Indeed, research on adolescent motherhood and poor child health has devoted a substantial amount of effort to establishing whether teen parenthood is actually to blame for diminished health outcomes for children – in other words, whether it is adolescent motherhood per se that is harmful to the health and development of children, or whether adolescent motherhood is merely a marker for other disadvantaged characteristics that are harmful to health. Some researchers have argued that little or no relationship exists between teen childbearing and infant health once family background is considered (e.g., Geronimus and Korenman 1993), while others conclude that, while diminished, direct effects of teen childbearing for child health remain (Fraser, Brockert and Ward 1995; Ketterlinus, Henderson, and Lamb 1990; Maynard 1997).

Clearly, the factors which place young women at risk of early childbearing often also place their infants at risk for poor health outcomes. Contextual factors such as growing up in poverty and residing in a disadvantaged neighborhood are well-known contributing factors (Furstenberg, Brooks-Gunn, and Morgan 1987; Bennett, et al. 1997; Hoffman 1998; Hogan and Kitigawa 1985), as are family variables reflecting poor family context, such as multiple siblings, low parental education and income, and low parental involvement (Haveman, et al. 1997;

Hoffman 1998; Hogan and Kitigawa 1985; Hogan, Sun, and Cornwell 2000). Social support from friends, family members, and male partners are also associated with improved maternal and infant health outcomes (Roye and Balk 1996; Turner, Grindstaff, and Phillips 1990), while individual delinquent or risk-taking behavior on the part of the adolescent is a known risk for both teen childbearing and poor infant health outcomes (Gillmore, et al. 1992). In particular, tobacco use during pregnancy has been associated with miscarriages, premature labor and delivery, low birth weight, mental retardation, and Sudden Infant Death Syndrome (DiFranze, et al. 1995; Haglund 1993).

The Importance of Race, Ethnicity, and Location of Residence

It is well known that rates of teen childbearing, while declining for all groups, vary by race and ethnicity. In 2002, birth rates for non-Hispanic black and Hispanic teenagers were 2.4 and 2.9 times higher, respectively, than rates for non-Hispanic white teenagers (Martin, et al. 2003). And, not surprisingly, racial disparities also exist in child health outcomes, including low birth weight and prematurity. Although higher among younger than older mothers, poor health outcomes are more prevalent among children born to black women of all ages (DuPlessis, Bell, and Richards 1997; Geronimus and Korenman 1993), while children born to Hispanic women experience similar, and sometimes better, health outcomes than non-Hispanic white children (DuPlessis, Bell, and Richards 1997; Landale, Oropesa, and Gorman 1999). For example, 10.4 percent of non-Hispanic white children were born prematurely in 2002, compared to 10.6 percent for Hispanic children and 16.0 percent for non-Hispanic black children (Martin, et al. 2003). The pattern for low birth weight is similar: 5.0 and 5.4 percent of non-Hispanic white and Hispanic children were low birth weight in 2002, compared to 11.4 percent of black children.

Studies which have sought to explain racial and ethnic differences often focus on socioeconomic explanations for the disadvantaged health outcomes of minority children, particularly blacks (see Conley, Strully, and Bennett 2003 for an excellent discussion of this literature). While evidence in support of a socioeconomic explanation is mixed, it is clear that socioeconomic circumstances account for at least some of the racial/ethnic variation in infant health. Going beyond a strictly socioeconomic argument, researchers have also argued for the importance of racism and discrimination, as well as cultural explanations (Conley, Strully, and Bennett 2003).

The role of racial discrimination has been posited as a factor contributing to the relationship between maternal age and the difference in infant health outcomes between Blacks and Whites. Geronimus (1996) finds that advancing maternal age is associated with a decreased odds of low birth weight for white children, but an increased odds of low birth weight for black children, and also demonstrates that the health profile of black women worsens considerably between the teenage and young adult years. She posits that racial inequality leads to the physical "weathering" of black women, resulting in the deterioration of health among black women in young adulthood, and thus an increase in the odds of having a low birth weight child in early adulthood. Other research has shown that racial disparities in teen birth outcomes are less pronounced compared to the racial disparities in infant health outcomes of older mothers, which does suggest a cumulative impact of poverty on health outcomes for racial and ethnic minority groups (Leland, et al. 1995).

Cultural explanations have most often been put forth to explain the paradoxically good health outcomes of children born to Hispanic women – that is, the reason why Hispanic mothers

have children with health profiles similar to non-Hispanic white children, even though their economic circumstances more closely resemble that of non-Hispanic blacks. Explanations for these paradoxical findings are usually tied to the presence of immigrants, who are believed to be healthier than the native-born due to selection, wherein immigrants are healthier and more resourceful (Guendelman 1995; Landale, Oropesa, and Gorman 2000). In addition, immigrants benefit from their more healthy behaviors (e.g., less smoking), less stress, and strong family ties (Finch, 2003; Landale et al. 1999; Rumbaut and Weeks 1996).

Even though race is clearly a central component in understanding teen childbearing and child health, we must also consider the role that residential location plays in this process. Many rural and nonmetro areas are characterized by economic conditions that present considerable challenges to the people that live there. Rural families have lower average incomes and higher poverty rates than do urban families (Lichter and Jensen, 2002; McLaughlin and Sachs, 1988; Snyder and McLaughlin, 2002; Snyder and McLaughlin, 2004). Unstable employment and limited access to health care are unfortunate features of many rural and nonmetro areas (Fitchen 1995; Jensen and Eggebeen 1994; Larson, Hart and Rosenblatt 1997; Lichter et al. 1994; Lichter and McLaughlin 1995). In addition, services that support working families, such as child care and transportation, are limited in these areas and operate as significant barriers to employment, especially for unmarried mothers (Blau 2001; Gordon and Chase-Lansdale 2001; Whitner, Weber and Duncan 2001), which can perpetuate the association between poor health and female-headed family status. Thus, the prevailing rural context can undermine health, including maternal and infant health, and especially among disadvantaged female-headed families.

Prior studies have found that residential health disparities exist in infant health outcomes

due in large part to inadequate prenatal and infant care in rural areas (Clark et al., 1994; Larson, Hart, and Rosenblatt 1992; Lawhorne, Zweig, and Tinker 1990; Miller, et al. 1996). Thus, the consequences of teen childbearing can be more problematic in rural areas. The structural lack of prenatal and infant health care in rural areas makes teenage childbearing and low birth weight babies a greater health threat in rural compared to urban areas because rural areas do not have the capacity to treat these common threats to maternal and child health (Clark et al., 1996). Thus, availability and utilization of health services for pregnant teens may explain much of both the racial/ethnic and residential disparities in the health of infants born to teen mothers.

DATA AND MEASURES

Data from the 1995 cycle of the National Survey of Family Growth (NSFG) are used to examine racial/ethnic and residential variation in the health outcomes of infants born to teen mothers. Collected and administered by the National Center for Health Statistics, the NSFG is a national probability sample of 10,847 women aged 15-45 in 1995 and was designed primarily to provide information on pregnancy and the health of U.S. women and infants. Analyses are weighted using the 1995 NSFG sampling weight, making them representative of the U.S. population of women aged 15-45 in 1995 (Potter, et al. 1997). The survey contains a wealth of retrospective data on fertility and family formation experiences, and birth outcomes, which makes it ideal for our study. The data set contains two files, a respondent file containing one record per woman, and an interval file containing one file per birth. There are a total of 21,221 birth records in the interval file. Our analyses are restricted to 6,704 first singleton births. These data are used to estimate the impact of race/ethnicity and residence on infant health outcomes, paying particular

attention to infants born to teen mothers. Specifically, we examine if (1) race/ethnicity and residence mediate the association between teen childbearing and poor infant health outcomes; and (2) if race/ethnicity and residence moderate the effect of teen childbearing on infant health outcomes.

Measures

The relationship between race/ethnicity, residence, and infant health outcomes is examined, controlling for relevant individual and family background characteristics. Our analyses are perhaps more descriptive than explanatory as these data do not permit us to test whether the association between race/ethnicity and residence and infant health outcomes is due to racial or residential differences in norms, behaviors, and cultural practices, or the socioeconomic conditions of specific racial and ethnic groups by locale. Instead, these factors can be tapped only indirectly through maternal and pregnancy outcome variables, which are closely tied to infant health outcomes (Sable and Wilkinson 2000; Sable, et al. 1997).

Outcomes. We examine two different measures of child health in this analysis. The first is the child's weight at birth: low birth weight (1 = less than 5.5 lbs at birth, 0 = 5.5 lbs and above) and the second is whether or not the infant was born preterm (1 = born at 37 weeks gestation or earlier, 0 = 38 weeks and above).

Independent Variables. Our main independent measure of interest is maternal age at birth. The 1995 NSFG recorded each woman's retrospective report of each pregnancy and live birth, and indicated their age when the child was born. From this we created a categorical measure distinguishing teen first births from those that occurred at older ages (under the age of 19 at first birth, and aged 20 and higher).

Given the well-documented racial and ethnic differences in teenage childbearing and child health (see above discussion), we include a categorical measure of the mother's race and ethnic background. *Race/ethnicity* is coded using three dummy variables: Hispanic, non-Hispanic black, and non-Hispanic white (reference). Due to the small sample size, all other racial and ethnic groups are excluded from our analyses.

Geographic residence distinguishes among women residing in metro and nonmetro areas. This measure is based on the U.S. Census classification of counties as metro or nonmetro at the time of the 1995 NSFG survey. We further delineate residence by separating central city metro residence from residence in the remainder of metro areas, which we classify as suburban metro residence. Prior research finds significant differences in family structure and well-being outcomes using this county-level categorization and indicates that a linear relationship does not exist between degree of urbanization and well-being outcomes (Snyder and McLaughlin 2004). Examining residential variation using a metro/nonmetro dichotomy would mask this relationship, yielding misleading results. Thus, we use the metro central city, metro suburban, and nonmetro categorization.

Geographic residence is measured at interview. Since we are relying on retrospective reports of family formation behaviors, some women lived elsewhere at the time of their first birth. Consequently, we re-estimated all of our models using a restricted sample that includes only those women who continuously resided in the same county between the time of their first birth and the 1995 NSFG interview date. With just two exceptions (noted in the results section), the analyses of the restricted samples produce results similar to those for the full sample and thus they are not included in the paper. Admittedly, this approach does not entirely resolve the challenges

associated with using retrospective data to examine residential differences in outcomes. For example, even if the respondent continuously resided in a county classified as metro in 1995 between the time of the event of interest and the interview date, the county may have been categorized as nonmetro in earlier years. Moreover, the direction of causality between nonmetro residence and individual characteristics is unclear; people with certain characteristics may be especially likely to reside in (non)metro areas. We acknowledge these limitations, but also note that other national studies that emphasize residence also face this same challenge (Heaton et al. 1989; Lichter and Graefe 2001).

Maternal Characteristics. We include several maternal characteristics as controls since they are related to child health and well-being. *Birth cohort* is measured categorically with five-year birth cohorts of the respondent's year of birth: 1976-1980, 1971-1975, 1966-1970, 1961-1965, 1956-1960, 1951-1955 (reference). Categorizing years of respondent's birth in this manner allows us to account for cohort effects in the events of interest. Given the importance of nativity for child health (Landale, Oropesa, and Gorman 1999), we also include a categorical measure of maternal immigrant status: *foreign born* versus native born. Finally, we include a categorical measure of the mother's marital status at the time the child was born: (a) married; (b) previously married but no longer married (divorced, separated, or widowed); and (c) never married.

Variables capturing the respondent's human capital are also included in the models. These include a measure of *educational attainment* at first birth (college degree or higher [reference], greater than high school education but not college degree, high school education only, or less than high school education) and *work experience* (any work experience at first birth or not).

We also control for two measures of maternal risky behavior. Women reported their age

at first intercourse, which we code into three categories: (a) under 15 years of age; (b) 15 to 18 years of age; and (c) 19 years old or higher. Second, women also report their number of lifetime sexual partners, which we code into three categories: (a) 1 to 4; (b) 5 to 10; and (c) 11 and higher.

Family Background Characteristics. The detailed information collected in the 1995 NSFG, particularly with regard to family background, allows us to include specific controls of the respondent's home and family life during childhood. We include *intact family during childhood* (whether or not the mother lived with both her parents until age 14) (1=yes, 0=no) as an indicator of family structure during childhood. *Mother's work status during childhood* (full-time, part-time, or not working [reference]), and *parental education* for both the respondent's mother and father (less than high school education, high school education, more than high school education [reference]). We also include a measure of the respondent's mother's age at first birth, *grandmother teen birth*, (1=19 or younger, 0=20 or older).

Pregnancy Related Variables. Four pregnancy-related measures are included in the full model. First, we include a categorical measure of pregnancy wantedness for both the mother of the child and her partner: 1 = wanted pregnancy at time got pregnant (reference), 2 = mistimed (didn't want the pregnancy then but wanted to get pregnant later), and 3 = unwanted pregnancy, don't know, or don't care either way. One measure of socioeconomic status is included. Women reported how hospital costs for the birth and hospital stay were paid for. Responses were coded into the following categories: private insurance, no governmental assistance (reference category); any government assistance; and no private or government insurance. Finally, we include a measure of type of delivery: 1=vaginal delivery, 0=cesarian section or combination of vaginal and cesarian delivery.

Analytic Strategy

Our goal is to better understand the association between teen childbearing and poor infant health by examining the influence of race/ethnicity and residence. We begin by describing the NSFG first birth sample, and how it varies by teen versus older mother status. Next, we examine the direct relationships between teen mother status and infant health outcomes, race/ethnicity and infant health outcomes, and mother's residential location and infant health. Third, we estimate multivariate models to determine whether race/ethnicity and residence mediate the relationship between teen mother status and infant health, and if the interaction between race/ethnicity and residence helps explain the association. Finally, we estimate age segregated models separately fo births to teen mothers and to older mothers to examine how the interactions between race and residence impact infant health.

RESULTS

Descriptive Results

Table 1 provides the weighted frequency distributions for the independent and dependent variables for the entire sample, and Table 2 provides these statistics by maternal age at birth. Overall, 7.7% of all births were low birth weight and 12.3% were pre-term status. Approximately 17% of the infants were born to a teen mother. Nearly 72% of infants were born to a Non-Hispanic White mother, 13% were born to a Non-Hispanic Black mother and 15.4% were born to an Hispanic mother. Most mothers were from metropolitan areas, 48.8% from suburban counties, 29.2% from central city areas, and 22% from nonmetro areas. These numbers accurately reflect the residential distribution of the U.S. population (U.S. Census Bureau, 2002). Further

examination of the maternal characteristics reveal that nearly two-thirds of the mothers were raised in an intact family, fewer than 10% were foreign born, most had a high school or better education at birth, most had some work experience at first birth, and almost three-fourths were married or previously married at the time of their first birth. Most of the mothers had fewer than four lifetime sexual partners and most had their first sexual intercourse between the ages of 15 and 19 (see Table 1).

Characteristics of the infant's grandparents, especially their education and work status, are indicators of the family context during the mother's life. Most of the grandparents had a high school or higher education, over a third of the grandmothers worked full-time during the mother's childhood, and approximately one-fifth of the mothers were themselves born to a teen mother. Qualification of receipt for government medical assistance for the infant's delivery is an additional indicator of economic well-being. Nearly one-fourth qualified for government insurance and an additional 17.8% had no insurance, but did not use any public insurance for their delivery costs. Over 75% of the births were vaginal (see Table 1).

Finally, the degree to which a pregnancy is planned and wanted has implications for infant's well-being. The NSFG data reveal that slightly over half of all first singleton births were wanted by both the mother and her partner. Differences emerge in the other two unwanted categories. Although not wanted at the time of pregnancy, 38.7% of respondents reported that the birth was merely mistimed and only 6.9% reported that it was completely unwanted. This compares to nearly 20% of the partners who reported that the pregnancy was unwanted (see Table 1).

[Insert Table 1 about here]

Table 2 describes the sample of first birth by age of the mother at the time of the birth. With the exception of pre-term status, these chi-square differences are all statistically significant at the p<=.01 level. Because significant variation in the pre-term status outcome does not exist by age of mother, we will not examine predictors of this outcome in multivariate models.

In general, the teen mothers represent a more disadvantaged group. A greater proportion of teen mothers in the sample come from a racial or ethnic minority group, more live in central city and nonmetro areas, and fewer live in suburban areas. Teen mother were less educated at the time of their first birth, had less work experience, and had parents who were less educated. A greater proportion of their mothers also worked full-time during their childhood, an indication of economic need. In addition, over half of their mothers were also teen mothers, compared to only 34.3% of the older mother group. A greater proportion of the teen mothers had five or more lifetime sexual partners and more had their first sexual experience prior to age 18 (see Table 2).

The pregnancy outcome variables reveal that more teen mothers used government insurance to pay for their delivery, which is an additional indicator of economic need. A greater percent of the teen mothers, and their partners, reported that their pregnancy was either mistimed or unwanted. Finally, a smaller percentage of teen mothers had a cesarian section birth (see Table 2).

[insert Table 2 about here]

Logistic Regression Models

Next, we use logistic regression models to estimate the odds of a low birth weight infant. Table 3 presents bivariate logistic regression models where low birth weight status is separately predicted by teen mother status, residential location, and race/ethnicity, and significant variation exists by all three predictors. The first row describes how teen mothers are approximately one-third more likely to have a low birth weight first birth. Metro-central city residents are approximately two -thirds more likely to have a low birth weight infant, and nonmetro residents are approximately one-third more likely to have a low birth weight infant, compared to their metro suburban counterparts. When considering race/ethnicity however, only Non-Hispanic Blacks are more likely than Whites to have a low-birth weight infant, and are approximately twice as likely to do so. Hispanic mothers are not significantly more likely than their Non-Hispanic White counterparts to have a low birth weight infant. These results indicate that teen status, residential location, and race/ethnicity are all significant and important indicators of infant low birth weight status.

[insert Table 3 here]

We next turn to the multivariate models, in Tables 4-6, to examine how age at birth, race/ethnicity and residence are associated with low birth weight status in a multivariate context. Table 4 includes three models, A, B, and C. Model A examines the association between teen mother status and infant low birth weight, controlling for the additive effects of residence and race. We find that controlling for race and residence reduces the effect of teen mother status non-

significant levels. In addition, both central city and nonmetro residents are approximately one-third more likely than their suburban counterparts to have a low birth weight infant, and Blacks are 80% more likely than whites to have a low birth weight infant. No significant differences exist between Hispanic and Non-Hispanic White mothers.

Model B takes a different approach. Rather than examining the additive effects of residence and race, this model includes the interactive effects of these two variables allowing the effect of race on low birth weight to differ across residential locations. With the exception of metro-suburban and nonmetro Hispanics, all interactions increase the odds of a low birth weight infant, relative to their metro-suburban counterparts. The strongest effects are noted for Non-Hispanic Blacks in all residential locations, followed by metro-central city Hispanics, and Non-Hispanic whites from both metro-central city and nonmetro areas. In addition, it is noteworthy that the effect of being both Non-Hispanic White and Non-Hispanic Black is approximately equivalent for metro-central city and nonmetro residents. When we add controls for other maternal characteristics, family background, and pregnancy-related variables the effect of being Non-Hispanic White in Metro-central city and Nonmetro areas persists, while that of being Non-Hispanic Black, in Metro-central city and suburban areas decreases but remains significant. The increased effect of being Non-Hispanic Black in Nonmetro areas on the odds of a low birth weight infants decrease to non-significant levels. This indicates that the control variables do not account for the higher odds of having a low birth weight infant for whites and Metro-central city Hispanics, account for some of the variance in infant low birth weight status for Metro-central city and suburban Blacks, and much of the variation in infant low birth weight status between Nonmetro Blacks and Metro-Suburban whites. The disadvantaged background of Nonmetro

Black women accounts for much of the low birth weight status of their first births.

[insert Table 4 here]

Another approach to examine infant birth weight outcomes is to run separate models for teen and older mothers, and we do so in Tables 5 and 6. Table 5 includes the same models from Table 4, only restricted to the sample of first births born to teen mothers. Model A includes race/ethnicity only. We find that among infants born to teen mothers, those born to a Black teen mother are 50% more likely than those born to a white mother to have a low birth weight. There is no significant effect of being born to a Hispanic mother. When residential location is added in Model B the race effect diminishes to non-significant levels, and the impact of residence is seen for teen mothers. Infants born to teen mothers in Metro-central city and Nonmetro areas are 70% and 60% more likely, respectively, to be low birth weight.

In order to examine how these two important factors combine to impact infant birth weight, Model C includes the interactive effects of these two variables allowing the effect of race on low birth weight to differ across residential locations. The interaction terms highlight the low birth weight problem for infants born to teen mothers in all residential areas, with the exception of those born to Hispanic teen mothers in Metro-suburban and Nonmetro areas, compared to Metro-suburban white teens. These interaction terms improve on the additive approach in Model B because we see how race does matter, it just depends on the residential location. Infants born to white and black teen mothers in all residential areas are significantly more likely than those born to Metro-suburban White mothers to be low birth weight, as are infants born to Hispanic teen

mothers living in Metro-central city areas. For example, infants born to Metro-central city, suburban and nonmetro Black teen mothers are 2.9, 2.6, and 2.7 times as likely, respectively, as those born to Metro-suburban White teen mothers to be low birth weight.

When we add controls for other maternal characteristics, family background, and pregnancy-related variables the effect of having a Non-Hispanic White mother in both Metro-central city and Nonmetro areas on infant's low birth weight status persists, as does the effect of having a Metro-suburban Black mother, although to a lesser degree. In fact, controlling for these factors strengthens the effect of having a Non-Hispanic White mother in a Metro-central city and nonmetro area on infant's low birth weight status. These findings indicate that the factors included in Model D explain the significant variation in infant low birth weight status of infants born to Metro-central city Hispanic and Non-Hispanic Black Mothers, and Nonmetro Non-Hispanic Black mothers, but not for comparative infants born to Non-Hispanic White mothers in Metro-central city and Nonmetro areas.

[insert Table 5 here]

Table 6 includes the same models as Table 5, but the analyses are restricted to infants born to mothers aged 20 and older at first birth. Model A includes race/ethnicity only. We find that among infants born to older mothers, those born to a Black teen mother are over two times more likely than those born to a white mother to have a low birth weight, and those born to a Hispanic mother are 50% more likely to have a low birth weight. When residential location is added in Model B the race effect persists, and the impact of residence is non-significant. This is the

opposite pattern observed for infants born to teen mothers in Table 5. Including the race by residence interaction terms reveals significant interaction effects. Infants born to non-teen Black mothers in all residential areas are over twice as likely to be born low birth weight. The same is true only for infants born to Hispanic mothers in Metro-central city and suburban areas, not for those born to Hispanic mothers in Nonmetro areas. When we add controls for other maternal characteristics, family background, and pregnancy-related variables the effect of having a Non-Hispanic Black mother in all areas on infant's low birth weight status persists, although the strength of the effects decrease a bit. The effect of having a Metro-central city Hispanic mother on infant's low birth weight status remains statistically significant and the strength of the effect persists. These findings indicate that other factors account for the association between race, residence and infant low birth weight status for Black older mothers and Hispanic older mothers in Metro central city areas.

[insert Table 6 here]

CONCLUSION

This paper set out to explore the importance of teenage childbearing for child health at birth, giving special attention to the roles of race, ethnicity, and residential location. We find that race/ethnicity and residential location are significant and important predictors of low birth weight status for infants. Examining interaction effects, as opposed to additive models, highlighted the role of these factors and their impact on infant birth weight, even beyond the effects of teen

mother status.

This research is by no means complete. In the future we plan to include indicators of service availability and utilization to explain the association between race/ethnicity, residential location and infant health outcomes.

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Table 1. Weighted percentages, full sample (n=6,704)

Variable	%
Dependent Measures	
Child low birth weight	7.7
Child Preterm	13.7
Parent age at birth of child	
Age of mother at birth	
Less than 17	7.6
18-19	9.3
20 years and older	83.1
Maternal Background/Demographics	
Birth Cohort	
1976-1980	2.2
1971-1975	9.1
1966-1970	15.8
1961-1965	22.9
1956-1960	16.1
1951-1955	23.9
Race/Ethnic group	
Non-Hispanic white	71.6
Non-Hispanic black	13.0
Hispanic	15.4
Residential location	
Central city residence	29.2
Suburban residence	48.8
Nonmetro residence	22.0
Intact family during childhood	63.1
Foreign born	9.3
Education level of mother at birth	
Less than high school	24.9
High school	40.0
More than high school, no college	22.4
College or higher	12.7
Any work experience of mother at birth	79.9
Marital status at birth	
Married	69.9
Previously married	2.5
Other	27.6

Table 1. Weighted percentages, full sample (n=6,704)

Variable	%
Grandmother's education	
Less than high school	36.2
High school	43.2
More than high school	20.6
Grandfather's education	
Less than high school	35.4
High school	36.4
More than high school	28.2
Grandmothers work during childhood	
Full-time	38.1
Part-time	18.4
No work	43.5
Grandmother's age at first birth	
Under age 18	19.3
18-19	21.7
20-24	41.6
25 and older	17.4
Number of lifetime sexual partners	
1-4	60.0
5-10	28.0
11 or more	12.0
Age at first sexual intercourse	
Under 15 years old	13.4
15-18 years old	59.3
19 years or older	27.3
Pregnancy Outcome Variables	
Method of payment for delivery	
Private insurance	58.4
Any government insurance	23.8
No insurance	17.8
Type of delivery	
Vaginal	79.7
Cesarian section	20.3
Respondent's pregnancy wantedness	
Wanted at time got pregnant	54.4
Too soon, mistimed	38.7
Unwanted, don't know, don't care	6.9
Partners pregnancy wantedness	
Wanted at time got pregnant	54.6
Too soon, mistimed	25.8
Unwanted, don't know, don't care	19.6

Table 2. Weighted percentages, by age of mother (n=6,704)

Mother 20 or older at birth (n=4,355)		Mother 19 or younger at birth (n=2,349)	
Variable	**%**	**Variable**	**%**
Dependent Measures		**Dependent Measures**	
Child low birth weight	7.0	Child low birth weight	9.2
Child Preterm	13.9	Child Preterm	13.3
Parent age at birth of child		**Parent age at birth of child**	
Age of mother at birth		Age of mother at birth	
Less than 17	-	Less than 17	-
18-19	-	18-19	-
20 years and older	-	20 years and older	-
Maternal Background/Demographics		**Maternal Background/Demographics**	
Birth Cohort		Birth Cohort	
1976-1980	0	1976-1980	2.2
1971-1975	5.2	1971-1975	9.1
1966-1970	16.2	1966-1970	15.8
1961-1965	25.1	1961-1965	22.9
1956-1960	28.5	1956-1960	16.1
1951-1955	25.0	1951-1955	23.9
Race/Ethnic group		Race/Ethnic group	
Non-Hispanic white	78.6	Non-Hispanic white	57.3
Non-Hispanic black	10.4	Non-Hispanic black	25.5
Hispanic	11.0	Hispanic	17.2
Residential location		Residential location	
Central city residence	26.5	Central city residence	34.6
Suburban residence	52.1	Suburban residence	42.0
Nonmetro residence	21.3	Nonmetro residence	23.4
Intact family during childhood	69.3	Intact family during childhood	50.2
Foreign born	9.6	Foreign born	8.6
Education level of mother at birth		Education level of mother at birth	
Less than high school	9.7	Less than high school	56.4
High school	42.6	High school	34.4
More than high school, no college	28.8	More than high school, no college	9.2
College or higher	18.9	College or higher	0.0
Any work experience of mother at birth	97.2	Any work experience of mother at birth	44.3
Marital/Cohabiting status at birth		Marital/Cohabiting status at birth	
Married	80.5	Married	48.1
Previously married	2.8	Previously married	2.0
Never married	16.8	Never married	49.9

Table 2. Weighted percentages, by age of mother (n=6,704)

Mother 20 or older at birth (n=4,355)		Mother 19 or younger at birth (n=2,349)	
Variable	**%**	**Variable**	**%**
Grandmother's education		Grandmother's education	
Less than high school	29.9	Less than high school	49.2
High school	46.3	High school	36.8
More than high school	23.8	More than high school	14.0
Grandfather's education		Grandfather's education	
Less than high school	32.0	Less than high school	42.5
High school	37.6	High school	33.9
More than high school	30.4	More than high school	23.7
Grandmothers work during childhood		Grandmothers work during childhood	
Full-time	33.8	Full-time	47.1
Part-time	19.7	Part-time	15.7
No work	46.6	No work	37.2
Grandmother's age at first birth		Grandmother's age at first birth	
Under age 18	14.0	Under age 18	30.3
18-19	20.3	18-19	24.5
20-24	44.4	20-24	35.8
25 or older	21.3	25 or older	9.4
Number of lifetime sexual partners		Number of lifetime sexual partners	
1-4	61.4	1-4	57.0
5-10	27.2	5-10	29.8
11 or more	11.4	11 or more	13.2
Age at first sexual intercourse		Age at first sexual intercourse	
Under 15 years old	6.6	Under 15 years old	27.2
15-18 years old	53.5	15-18 years old	71.5
19 years or older	39.9	19 years or older	1.3
Pregnancy Outcome Variables		**Pregnancy Outcome Variables**	
Method of payment for delivery		Method of payment for delivery	
Private insurance	69.8	Private insurance	34.7
Any government insurance	15.5	Any government insurance	41.0
No insurance	14.7	No insurance	24.3
Type of delivery		Type of delivery	
Vaginal	75.8	Vaginal	87.8
Cesarian section	24.2	Cesarian section	12.2
Respondent's pregnancy wantedness		Respondent's pregnancy wantedness	
Wanted at time got pregnant	66.0	Wanted at time got pregnant	30.6
Too soon, mistimed	29.2	Too soon, mistimed	58.3
Unwanted, don't know, don't care	4.8	Unwanted, don't know, don't care	11.1
Partners pregnancy wantedness		Partners pregnancy wantedness	
Wanted at time got pregnant	63.5	Wanted at time got pregnant	36.4
Too soon, mistimed	23.3	Too soon, mistimed	30.9
Unwanted, don't know, don't care	13.2	Unwanted, don't know, don't care	32.7

N=6,704 births
All chi-square differences by age of mother significant at p<=.001 level, the exception being “preterm status” where no significant chi-square differences exist.

Table 3. Bivariate Logistic Regression Models Predicting Low Birth Weight

Variable	ℊ	*Odds Ratio*
Age 19 or younger at first birth	*.290***	*1.34*
Residence (Metro-suburban omitted)		
Metro-central city resident	*.481***	*1.62*
Nonmetro resident	*.267**	*1.31*
Race/Ethnicity (Non-Hispanic White omitted)		
Non-Hispanic Black	*.689***	*2.00*
Hispanic	*.242*	*1.27*

Table 4. Logistic Regression Model Predicting Low Birth Weight (n=6,704 births): Race/ethnicity and Residence mediating effect of age at first birth

Variable	*Model A*		*Model B*		*Model C*	
	β	***OR***	*β*	***OR***	*β*	***OR***
Intercept						
Teen mother at first birth	*.131*	*1.14*	*.138*	*1.15*	*-.108*	*.89*
Residence (suburban metro omitted)						
Central city metro	*.275***	*1.32*	*-*	*-*	*-*	*-*
Nonmetro	*.271**	*1.31*	*-*	*-*	*-*	*-*
Race/Ethnicity (NH white omitted)						
Non-Hispanic Black	*.585****	*1.80*	*-*	*-*	*-*	*-*
Hispanic	*.190*	*1.21*	*-*	*-*	*-*	*-*
Race by Residence Interaction (suburban whites omitted)						
Metro-cc Hispanic						
Metro-cc Non-Hispanic White			*.582****	*1.79*	*.516***	*1.68*
Metro-cc Non-Hispanic Black			*.459***	*1.58*	*.433***	*1.54*
Metro-sub Hispanic			*.892****	*2.44*	*.629****	*1.88*
Metro-sub Non-Hispanic Black			*.356*	*1.43*	*.344*	*1.41*
Nonmetro Hispanic			*.830****	*2.29*	*.592***	*1.81*
Nonmetro Non-Hispanic White			*-.053*	*.95*	*-.067*	*.94*
Nonmetro Non-Hispanic Black			*.421***	*1.52*	*.393***	*1.48*
			*.911****	*2.49*	*.560*	*1.75*
Birth Cohort (1951-1955 omitted)						
1976-1980					*-.860**	*.42*
1971-1975					*-.235*	*.79*
1966-1970					*-.186*	*.83*
1961-1965					*-.007*	*.99*
1956-1960					*.004*	*1.00*
Marital Status at Birth (married omitted)						
Ever previously married						
Never married					*.164*	*1.18*
					.224	*1.25*

Table 4. Logistic Regression Model Predicting Low Birth Weight (n=6,704 births): Race/ethnicity and Residence mediating effect of age at first birth

Variable	*Model A*		*Model B*		*Model C*	
	✍	***OR***	✍	***OR***	✍	***OR***
Education level of mother at birth (college or higher omitted)						
Less than high school					*.127*	*1.14*
High school					*.136*	*1.15*
More than high school, no college					*-.040*	*.96*
Any work experience of mother at birth						
					-.134	*.88*
Intact Family During Childhood					*.012*	*1.01*
Grandmother's education (more than high school omitted)						
Less than high school						
High school					*-.036*	*.97*
					-.115	*.90*
Grandfather's education (more than high school omitted)						
Less than high school						
High school					*.192*	*1.21*
					.068	*1.07*
Grandmothers work during childhood (no work omitted)						
Full-time						
Part-time					*.164*	*1.18*
					.098	*1.10*
Grandmother teen birth					*.017*	*1.02*
Foreign Born					*-.065*	*.94*
Method of payment for delivery (private insurance omitted)						
Any government insurance					*.250**	*1.28*
No insurance					*-.269*	*.76*
Vaginal delivery					*-.437****	*.65*
Respondent's pregnancy wantedness (wanted at time omitted)						
Too soon, mistimed					*.058*	*1.06*
Unwanted, don't know, don't care					*-.024*	*.98*
Partners pregnancy wantedness (wanted at time omitted)						
Too soon, mistimed					*.166*	*1.18*
Unwanted, don't know, don't care					*-.030*	*.97*
Number of lifetime sexual partners (1-4 omitted)						
5-10					*-.084*	*.92*
11 or more					*-.075*	*1.08*

Table 4. Logistic Regression Model Predicting Low Birth Weight (n=6,704 births): Race/ethnicity and Residence mediating effect of age at first birth

Variable	*Model A*		*Model B*		*Model C*	
	✍	***OR***	✍	***OR***	✍	***OR***
Age at first sexual intercourse (under 15 years omitted)						
15-18 years old						
19 years or older					*.370**	*1.45*
					.242	*1.27*
N(df)	*6704 (5)*		*6704 (9)*		*6704 (40)*	
-2(log likelihood)	*3802.28*		*3896.79*		*3727.20*	

OR = Odds Ratio.

Table 5. Logistic Regression Models Predicting Low Birth Weight for Teen Mothers Only (n=2,349)

Variable	Model A		Model B		Model C		Model D	
	✍	*OR*	✍	*OR*	✍	OR	✍	*OR*
Intercept	*-2.36*		*-2.67*		*-2.97*		*-3.35*	
Race/Ethnicity (NH white omitted)	*.413***							
Non-Hispanic Black	*-.138*	*1.5*	*.278*	*1.3*				
Hispanic		*.87*	*-.189*	*.83*				
Residence (suburban metro omitted)								
Central city metro			*.551***	*1.7*				
Nonmetro			*.504**	*1.6*				
Race by Residence Interaction (suburban whites omitted)								
Metro-cc Hispanic								
Metro-cc Non-Hispanic White					*0.73**	*2.1*	*.610*	*1.8*
Metro-cc Non-Hispanic Black					*1.08****	*3.0*	*1.100****	*3.0*
Metro-sub Hispanic					*1.05****	*2.9*	*.730*	*2.1*
Metro-sub Non-Hispanic Black					*0.24*	*1.3*	*.180*	*1.2*
Nonmetro Hispanic					*0.94***	*2.6*	*.625**	*1.9*
Nonmetro Non-Hispanic White					*-0.16*	*0.9*	*-.247*	*0.8*
Nonmetro Non-Hispanic Black					*0.91****	*2.5*	*.960****	*2.6*
					*1.01***	*2.7*	*.640*	*1.9*
Birth Cohort (1951-1955 omitted)								
1976-1980							*-.842**	*0.4*
1971-1975							*-.384*	*0.7*
1966-1970							*-.013*	*1.0*
1961-1965							*.094*	*1.1*
1956-1960							*-.090*	*0.9*
Marital Status at Birth (married omitted)								
Ever previously married							*-.49*	*0.6*
Never married							*.23*	*1.3*

Education level of mother at birth (more than high school omitted)		
Less than high school		
High school	*-.038*	*1.0*
	-.015	*1.0*
Any work experience of mother at birth	*-.109*	*0.9*
Intact Family During Childhood	*-.068*	*0.9*
Grandmother's education (more than high school omitted)		
Less than high school		
High school	*.469*	*1.6*
	.388	*1.5*
Grandfather's education (more than high school omitted)		
Less than high school		
High school	*.213*	*1.2*
	.045	*1.0*
Grandmothers work during childhood (no work omitted)		
Full-time		
Part-time	*.579****	*1.8*
	*.614***	*1.8*
Grandmother teen birth	*-.142*	*0.9*
Foreign Born	*.093*	*1.1*
Method of payment for delivery (private insurance omitted)		
Any government insurance		
No insurance	*.262*	*1.3*
	-.194	*0.8*
Vaginal delivery	*.242*	*0.8*
Respondent's pregnancy wantedness (wanted at time omitted)		
Too soon, mistimed		
Unwanted, don't know, don't care	*.237*	*1.3*
	-.000	*1.0*

Partners pregnancy wantedness					
(wanted at time omitted)					
Too soon, mistimed				*-.100*	*0.9*
Unwanted, don't know, don't care				*-.337*	*0.7*
Number of lifetime sexual partners					
(1-4 omitted)					
5-10				*-1.04*	*0.9*
11 or more				*-0.02*	*1.0*
Age at first sexual intercourse (19 years or older omitted)					
LT 15 years old					
15-18 years old				*0.12*	*1.1*
				-0.19	*0.8*
N(df)	*2,349 (2)*	*2,349 (4)*	*2,349 (8)*		*2,349 (38)*
-2(log likelihood)	*1,503.45*	*1,491.89*	*1,483.51*		*1,437.59*

*=p<=.05; **=p<=.01; ***=p<=.001

Table 6. Logistic Regression Models Predicting Low Birth Weight for Non-Teen Mothers Only (n=4,355)

Variable	*Model A*		*Model B*		*Model C*		*Model D*	
	ß	*OR*	*ß*	*OR*	*ß*	OR	*ß*	*OR*
Intercept	*-2.77*		*-2.82*		*-2.85*		*-2.45*	
Race/Ethnicity (NH white omitted)	*.799****							
Non-Hispanic Black	*.422***	*2.2*	*.772****	*2.2*				
Hispanic		*1.5*	*.407**	*1.5*				
Residence (suburban metro omitted)								
Central city metro			*.120*	*1.1*				
Nonmetro			*.124*	*1.1*				
Race by Residence Interaction (suburban whites omitted)								
Metro-cc Hispanic								
Metro-cc Non-Hispanic White					*.562***	*1.8*	*.535**	*1.7*
Metro-cc Non-Hispanic Black					*.191*	*1.2*	*.154*	*1.2*
Metro-sub Hispanic					*.885****	*2.4*	*.673***	*2.0*
Metro-sub Non-Hispanic Black					*.485**	*1.6*	*.487*	*2.6*
Nonmetro Hispanic					*.842****	*2.3*	*.666***	*1.9*
Nonmetro Non-Hispanic White					*.163*	*1.2*	*.278*	*1.3*
Nonmetro Non-Hispanic Black					*.171*	*1.2*	*.120*	*1.1*
					*.966***	*2.6*	*.679**	*2.0*
Birth Cohort (1951-1955 omitted)								
1971-1975							*.017*	*1.0*
1966-1970							*-.290*	*0.7*
1961-1965							*.049*	*0.9*
1956-1960							*.030*	*1.0*
Marital Status at Birth (married omitted)								
Ever previously married							*.289*	*1.3*
Never married							*.204*	*1.2*

Education level of mother at birth (college or more omitted)		
Less than high school		
High school	*.203*	*1.2*
More than high school	*.163*	*1.2*
	-.068	*0.9*
Any work experience of mother at birth	*-.189*	*0.8*
Intact Family During Childhood	*.062*	*1.1*
Grandmother's education (more than high school omitted)		
Less than high school		
High school	*-.276*	*0.8*
	-.337	*0.7*
Grandfather's education (more than high school omitted)		
Less than high school		
High school	*.184*	*1.2*
	.100	*1.1*
Grandmothers work during childhood (no work omitted)		
Full-time		
Part-time	*-.074*	*0.9*
	-.177	*0.8*
Grandmother teen birth	*.117*	*1.1*
Foreign Born	*-.149*	*0.9*
Method of payment for delivery (private insurance omitted)		
Any government insurance		
No insurance	*.237*	*1.3*
	*-.388**	*0.7*
Vaginal delivery	*-.515****	*0.6*
Respondent's pregnancy wantedness (wanted at time omitted)		
Too soon, mistimed		
Unwanted, don't know, don't care	*-.059*	*0.9*
	-.024	*1.0*

Partners pregnancy wantedness					
(wanted at time omitted)					
Too soon, mistimed				*.307*	*1.4*
Unwanted, don't know, don't care				*.228*	*1.3*
Number of lifetime sexual partners					
(1-4 omitted)					
5-10				*-.111*	*0.9*
11 or more				*.108*	*1.1*
Age at first sexual intercourse (under 15 years omitted)					
15-18 years old					
19 years or older				*.153*	*1.2*
				*.301**	*1.4*
N(df)	*4,355 (2)*	*4,355 (4)*	*4,355 (8)*	*4,355 (38)*	
-2(log likelihood)	*2301.26*	*2300.21*	*2299.38*	*2237.60*	