Trends in Birth across High-Parity Groups by Race/Ethnicity and Maternal Age

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Background: The changing racial and ethnic diversity of the U.S. population along with delayed childbearing suggest that shifts in the demographic composition of gravidas are likely. It is unclear whether trends in the proportion of births to parous women in the United States have changed over the decades by race and ethnicity, reflecting parallel changes in population demographics.

Methods: Singleton deliveries ≥20 weeks of gestation in the United States from 1989 through 2000 were analyzed using data from the "Natality data files" assembled by the National Center for Health Statistics (NCHS). We classified maternal age into three categories; younger mothers (aged <30 years), mature mothers (30–39 years) and older mothers (≥40 years) and maternal race/ethnicity into three groups: blacks (non-Hispanic), Hispanics and whites (non-Hispanic). We computed birth rates by period of delivery across the entire population and repeated the analysis stratified by age and maternal race. Chi-squared statistics for linear trend were utilized to assess linear trend across three four-year phases: 1989–1992, 1993–1996 and 1997–2000. In estimating the association between race/ethnicity and parity status, the direct method of standardization was employed to adjust for maternal age.

Results: Over the study period, the total number of births to blacks and whites diminished consistently (p for trend <0.001), whereas among Hispanics a progressive increase in the total number of deliveries was evident (p for trend <0.001). Black and white women experienced a reduction in total deliveries equivalent to 10% and 9.3%, respectively, while Hispanic women showed a substantial increment in total births (25%). Regardless of race or ethnicity, birth rate was associated with increase in maternal age in a dose-effect fashion among the high (5–9 previous live births), very high (10–14 previous live births) and extremely high (≥15 previous live births) parity groups (p for trend <0.001). After maternal age standardization, black and Hispanic women were more likely to have higher parity as compared to whites.

Conclusions: Our findings demonstrate substantial variation in parity patterns among the main racial and ethnic populations in the United States. These results may help in formulating strategies that will serve as templates for optimizing resource allocation across the different racial/ethnic subpopulations in the United States.

Key words: trends ■ fertility patterns ■ race/ethnicity ■ maternal age ■ singletons ■ United States

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INTRODUCTION

The published evidence showing that high-parity women are at greater risk for adverse birth outcomes is inconclusive. Whereas some studies find a direct association between parity status and adverse birth outcomes,[1-3] others do not.[4-6] In order to understand the linkage between parity status and adverse birth outcomes, it may be necessary to investigate temporal changes within certain sociodemographic entities, a step that could provide etiologic clues to these findings. However, it remains unknown whether the proportion of births to high-parity women has changed over the past decades, reflecting certain shifts in the demographic composition of gravidas in the United States. This issue is important, as the demography of the country continues to expand and diversify. For instance, during the last half of the 20th century, racial and ethnic diversity increasingly characterized the population of the United States. As of 1998, immigrants comprised approximately 9% of the U.S. population[7,8] and, consequently, the proportion of births to foreign-born women has risen.[8] In addition, the age distribution of pregnant women in the United States has changed. Whereas childbearing among women in their 20s has slightly declined or remained

stagnant, birth rates for women aged ≥35 have increased consistently.[9,10]

As a result of the aforementioned demographic trends among childbearing mothers in the United States, we sought to examine whether these changes have affected birth rates to parous mothers. The primary aim of this study was to explore temporal variations in live-born parity by race and maternal age in the United States from 1989 through 2000. While considering that adverse outcomes are more common with advanced age and high parity, we undertook the study with the following specific objectives:

1. Determine temporal trends in birth rates to women across live-born parity subgroups in the United States from 1989–2000.
2. Assess temporal variations in birth rates by race/ethnicity within each parity category.
3. Estimate racial and ethnic differences in birth rates across the parity subgroups after taking into account the overall contribution of observed maternal age-related trends in birth rates.

MATERIALS AND METHODS

We used the "Natality data files" assembled by the National Center for Health Statistics (NCHS) covering the period 1989–2000. The Natality files contain individual records of all live births that occurred in the United States during the stated period. The procedures for quality control of the data are explained in detail elsewhere.[11,12] The data source forms the basis for official U.S. birth statistics.

We selected singleton live births ≥20 weeks for analysis. We defined live-born parity as the total number of live deliveries the mother had experienced. For the purpose of this study, we classified mothers into four parity subgroups: moderate (1–4 previous live births), high (5–9 previous live births), very high (10–14 previous live births) and extremely high parity (≥15 previous live deliveries). We merged birth counts into three four-year phases: 1989–1992, 1993–1996 and 1997–2000, as paucity of numbers in some tabulated cells would make meaningful analysis difficult or impossible.

The interval between the first day of the last menstrual period (LMP) and the date of birth was used to compute gestational age in completed weeks. Records without the date of the LMP were imputed when there was a valid month and year. Clinical estimate of gestation was used from 1989 to 1998 in the computation of gestational age in those cases where the date of the LMP was not reported or where the LMP date was inconsistent with the birthweight.[12] Approximately 4–5% of the gestational ages during the period were based on this estimate. We restricted our analyses to live births and fetal deaths within 20–44 gestational weeks.

We defined birth rate within a parity subgroup as the total number of births observed in that subgroup divided by the total number of deliveries for that period (including those among nulliparous women) multiplied by 1,000. For example, the birth rate for women of moderate parity comprises all births to these women as the numerator and the total U.S. births for that period as the denominator multiplied by 1,000. We computed birth rates by period of delivery across the entire population and repeated the analysis stratified by age and maternal race. We used the term "rate" in this study to describe crude frequencies across time periods as is universally reported for other pregnancy or birth-associated events (e.g. stillbirth rate, neonatal mortality rate, etc.).[13,14]

In the case of maternal age, three categories were constructed: younger mothers (aged <30 years), mature mothers (30–39 years) and older mothers (≥40 years). Because of the rarity of higher gradations of parity among teenagers, our analysis did not investigate teen mothers as a separate entity. Maternal race/ethnicity was considered under three categories: blacks (non-Hispanic), Hispanics and whites (non-Hispanic). Other racial or ethnic groups were not included in the analysis because of paucity of numbers.

Statistical Analysis

We computed trend statistics to assess linear trend by means of the Chi-squared statistics for lin-

Table 1. Temporal Trends in Rates of Birth by Parity Status, United States, 1989–2000

Live-Born Parity	1989–1992 *N=11,897,787	1993–1996 *N=15,199,699	1997–2000 *N=15,221,188	P for Trend
1-4	8,628,275 (725.2)	8,212,397 (540.3)	8,345,777 (548.3)	<0.001
5–9	634,152 (53.3)	615,588 (40.5)	593,626 (39.0)	<0.001
10–14	8,328 (0.7)	9,120 (0.6)	18,265 (1.2)	<0.001
≥15	476 (0.04)	304 (0.02)	609 (0.04)	0.4

*N = total number of births. Values in parentheses are expressed as rates per 1000. Rate was defined as: total number of births in a specific parity group divided by the total number of births in all parity groups multiplied by 1,000. Note: Column totals will not add up to N (total numbers) because nulliparous women were excluded from the stratification.

ear trend. In estimating the association between race/ethnicity and parity status, we used the direct method of standardization to adjust for maternal age.[15] All tests of hypothesis were two-tailed with a type-1 error rate fixed at 5%. This study was approved by the Institutional Review Board at the University of Alabama at Birmingham.

RESULTS

Temporal variations in live-born parity are shown in Table 1. Among women of moderate parity (1–4 previous live births), the birth rates declined between the first and the second period and then remained almost stable by the third period. Among high-parity women (5–9 previous live births) a linear pattern of temporal trajectory was observed, with birth rates declining consistently across the three period quartiles. The trend in birth rates among very-high-parity women (10–14 previous live births) was also approximately linear but in an ascending fashion. By contrast, the trend among extremely-high-parity women was nonlinear. The proportion of births among these mothers was equally high in the first and last periods (four births per 100,000) but dropped in the intervening period (down to two births per 100,000) so that the overall temporal trajectory appeared U-shaped.

Results of trend analysis across parity subgroups by race and ethnicity are presented in Table 2. Over the study period, the total number of births among blacks and whites diminished consistently (p for trend <0.001), whereas among Hispanics the total number of deliveries increased progressively (p for trend <0.001). In percentage terms, black and white women experienced an almost equal level of reduction in total deliveries, equivalent to 10% and 9.3%, respectively, over the study period. By contrast, Hispanic women again showed a substantial percentage increase in total births (almost 25%). For moderate-parity women (1–4 previous live births), there appears to be no racial/ethnic variation in the rates of birth across the period quartiles. Birth rates among both moderate-parity black and white mothers were high in the initial period followed by a decline in the second period and finally a rise in the third period, thus describing an imperfect U-pattern. For moderate-parity Hispanic mothers, however, birth rates declined slightly from the first to the second period and then rose in the third period to form a J-shape pattern. Overall, a significantly net positive trend was noted for whites as well as Hispanics (0.6% and 2.0%) but not for blacks (0.07%) in this parity subgroup.

Among high-parity black mothers (5–9 previous live births) birth rates went up moderately and then declined, whereas among Hispanics a consistent decline was noted. On the other hand, among high-parity whites, a consistent increase in birth rates was observed over the three time periods studied. Noteworthy is that the lowest birth rates in the high-parity subgroup were among white mothers. For very-high-

Figure 1. Standardized estimates for the association between parity status and race/ethnicity, United States 1989–2000 (Whites are the referent group).

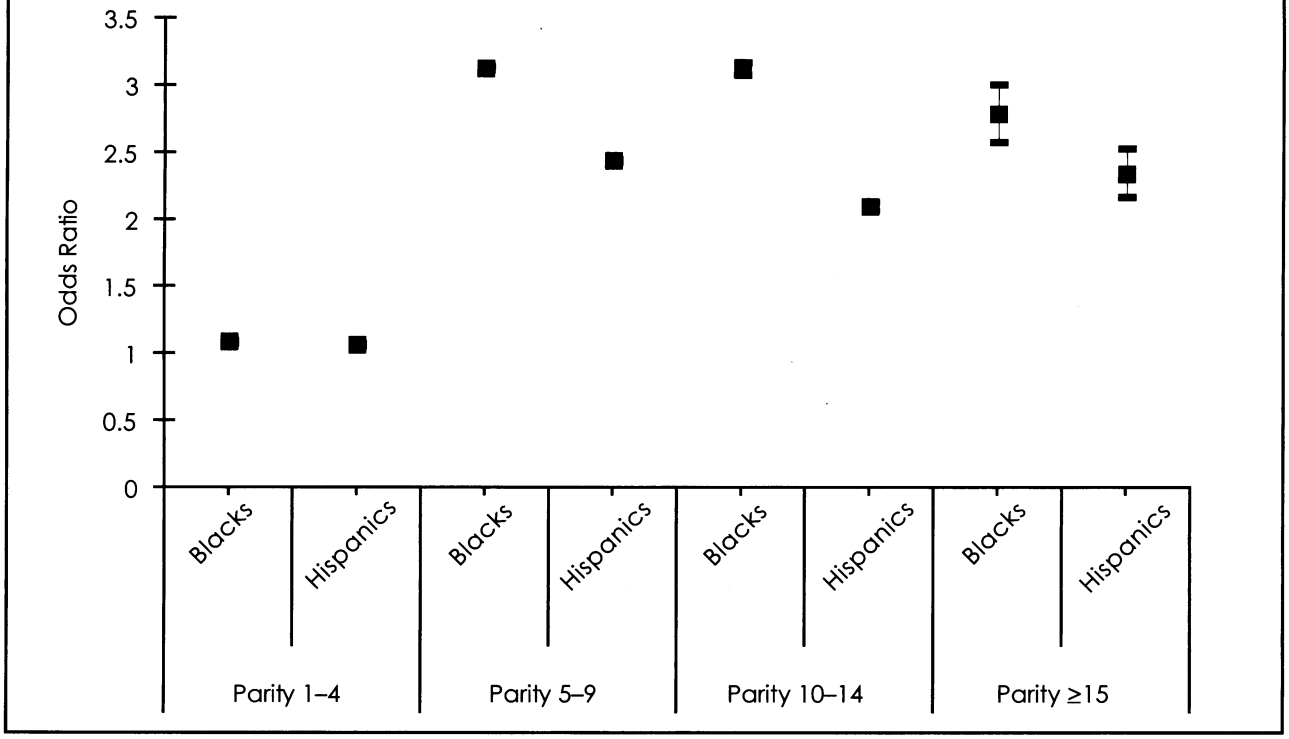

Table 2. Temporal Trends in Birth Rates by

	Blacks				
	1989–1992	1993–1996	1997–2000	P for Trend	1989–1992
Live-Born Parity	N*=2,543,464	N=2,342,300	N=2,282,627	<0.001	N*=2,980,763
1–4	1,383,563 (544.0)	1,253,030 (535.0)	1,242,929 (544.4)	0.6	1,617,382 (542.6)
5–9	162,512 (63.9)	158,596 (67.7)	145,684 (63.8)	0.8	192,536 (64.6)
10–14	1,832 (0.7)	2,243 (1.0)	4,450 (1.9)	<0.001	2,932 (1.0)
≥15	75 (0.03)	69 (0.03)	122 (0.05)	<0.001	89 (0.03)

*N = total number of births. Values in parentheses are rates per 1,000. Rate was defined as: total number of births in a specific parity group for a time period multiplied by 1,000. Note: Column totals will not add up to N (total numbers) because nulliparous women were excluded from the

Table 3. Trends in Birth Rates by Race/Ethnicity Stratified by

	Blacks				
	Maternal Age <30 Years	Maternal Age 30–39 Years	Maternal Age ≥40 Years	P for Trend	Maternal Age <30 Years
Live-Born Parity	N*=5,510,837	N=1,530,151	N=89,199	<0.001	N*=7,132,575
1–4	2,827,323 (513.0)	1,000,749 (654.0)	51,450 (576.8)	<0.001	3,591,067 (503.5)
5–9	228,325 (41.4)	216,081 (141.2)	22,386 (251.0)	<0.001	193,819 (27.2)
10–14	895 (0.2)	6,156 (4.0)	1,474 (16.5)	<0.001	661 (0.1)
≥15	14 (0.003)	131 (0.1)	121 (1.4)	<0.001	14 (0.002)

*N = total number of births. Values in parentheses are rates per 1,000. Rate was defined as: total number of births to mothers of a given maternal age group multiplied by 1,000. Note: Column totals will not add up to N (total numbers) because nulliparous women were excluded from the

parity mothers (10–14 previous live births), birth rates among blacks consistently increased over the years in a dose-dependent fashion (p for trend <0.001). Among Hispanics, there was an initial moderate drop followed by a substantial increase, whereas for whites the rates remained stable in the first two periods followed by an increase. Again, whites tended to have consistently lower rates of birth in this parity subgroup. Among extremely-high-parity women (≥15 previous live births), a positive temporal trend was noted among blacks and Hispanics only.

Trends in birth rates by parity subgroups stratified by maternal race and age are presented in Table 3. Within the moderate parity category, the proportion of births was lowest among younger mothers (age <30 years) and highest among mature mothers (age 30–39 years), whereas older mothers (age ≥40 years) were in-between. White mothers also showed higher birth rates among older women as compared to blacks and Hispanics. Within the high-, very-high- and extremely-high-parity groups, birth rates among whites were lowest irrespective of the maternal age category and the period quartile. Also, regardless of the racial or ethnic group, birth rate was associated with increase in maternal age in a dose-effect fashion among the high-, very-high- and extremely-high-parity groups, a finding that illustrates a strong and direct correlation between advancing maternal age and increase in parity status. Because of this observation, we proceeded to estimate the relationship between parity status and race/ethnicity using the method of direct standardization to account for the influence of maternal age.

Figure 1 illustrates the relationship between race/ethnicity and parity status after maternal age standardization with whites as the referent group. The referent category bears an odds ratio of 1.0 (this is represented by the dashed horizontal line parallel to the X-axis). Point estimates and surrounding confidence intervals are represented by the bars. Black and Hispanic women were more likely to have higher parity as compared to whites. The racial/ethnic difference in parity status was moderate for moderate level of parity, and greatest for very-high-parity status. This difference was more manifest between black mothers and white mothers than between whites and Hispanics.

DISCUSSION

The question of whether demographic trends have affected birth rates of parous mothers is of interest to researchers and policymakers, especially in the context of ensuring optimal and equitable allocation of resources. Perhaps the most important finding in this analysis is that overall, although total births declined over the study period among blacks as well as whites (by 10% and 9%, respectively), Hispanic women experienced an increase in total births of about 25%. These results are in agreement with projections made regarding the rise in birth contribution by the Hispanic subpopulation in the United States.[16,17] The implica-

Race/Ethnicity across Parity Subtypes, United States, 1989–2000

Hispanics			Whites			
1993–1996	1997–2000	P for Trend	1989–1992	1993-1996	1997-2000	P for Trend
N=3,333,387	N=3,716,017	<0.001	N*=9,965,763	N=9,330,465	N=9,038,981	<0.001
1,804,923 (541.4)	2,057,506 (553.7)	<0.001	5,422,811 (544.1)	5,052,724 (541.5)	4,945,871 (547.2)	<0.001
191,032 (57.3)	183,268 (49.3)	<0.001	264,340 (26.5)	257,275 (27.6)	257,372 (28.5)	<0.001
2,703 (0.8)	4,590 (1.2)	<0.001	3,727 (0.4)	4,032 (0.4)	8,984 (1.0)	<0.001
72 (0.02)	138 (0.03)	0.06	146 (0.01)	137 (0.01)	299 (0.03)	<0.001

specific period of birth within a given racial/ethnic category divided by the total number of births in that racial/ethnic group for the given stratification.

Maternal Age across Parity Subtypes, United States, 1989–2000

Hispanics			Whites			
Maternal Age 30–39 Years	Maternal Age ≥40 Years	P for Trend	Maternal Age <30 Years	Maternal Age 30–39 Years	Maternal Age ≥40 Years	P for Trend
N=2,727,398	N=170,194	<0.001	N=17,767,511	N=10,056,754	N=510,944	<0.001
1,794,526 (658.0)	94,218 (553.6)	<0.001	8,405,706 (473.1)	6,704,915 (666.7)	310,785 (608.3)	<0.001
326,483 (119.7)	46,534 (273.4)	<0.001	197,489 (11.1)	506,961 (50.4)	74,537 (145.9)	<0.001
6,214 (2.3)	3,350 (19.7)	<0.001	668 (0.04)	9,275 (0.9)	6,800 (13.3)	<0.001
128 (0.1)	157 (0.9)	<0.001	16 (0.001)	168 (0.02)	398 (0.8)	<0.001

age category and parity within a given racial/ethnic subpopulation divided by the total number of births in that racial/ethnic group for that stratification.

tions of these findings must be viewed in the context of future sectoral demands on the health sector.

About 63% of births to Hispanic women nationwide (and up to 75% in some states) occur among foreign-born Hispanics, many of whom may not qualify for health insurance coverage.[18,19] Indeed, pregnant Hispanic women and their children fare the worst in terms of insurance coverage due to lower employer-supported insurance benefits as compared to whites. Data from the National Health Interview Survey (NHIS) show that each year, an estimated 3 million Hispanic/Latino children lack health insurance coverage.[20] Following delivery, however, regardless of maternal citizenship, their neonates (who are automatically U.S. citizens) become qualified for public benefits, such as Medicaid and the State Children's Health Insurance Program (SCHIP). Public-funded programs thus represent a significant source of insurance coverage for Hispanic children. For instance, in 2001, Hispanic children had a rate of Medicaid coverage of 34.9% compared to 15.3% of non-Hispanic white children.[21] A recent study of SCHIP enrollees in Alabama, Florida, Kansas and New York (26% of enrollees nationwide) also found substantial numbers of enrollees were Hispanic or black children.[22] It is axiomatic that as the Hispanic population increases, so will its need for access to healthcare services. Our results strongly suggest that the demand on Medicaid and other public-funded programs will continue to increase based on the current temporal increase in births among Hispanics.

Several reasons might explain the positive birth rate trend among Hispanics. Foremost among these is the dominant belief that childbearing forms an important component of family functions, and the rearing of children within the family is highly encouraged.[23,24] Hispanic women, especially recent immigrants who are less acculturated and of low socioeconomic status, adhere strongly to the belief that frequent childbearing confers respect from their community, love and commitment from the father of the baby and is a guarantee that they will have someone to support and care for them at old age.[25,26]

Another reason for frequent childbearing may be the relatively low rate of contraceptive use among Latina women,[23] possibly because of religious or cultural objections to contraception.[27] Also linked to a low utilization of contraception is the "son preference" phenomenon, whereby the Hispanic woman will shy away from contraception and continue to become pregnant until she can deliver a son, even if the desired family size has been attained.[25]

A limitation of this study is its inability to determine the influence of religious, cultural and socioeconomic factors on frequent births among the women. It would, for instance, be interesting to assess whether the influence of religious affiliation on family size varied by race/ethnicity of mothers. Unfortunately, this kind of information was not available in the dataset. It was also not possible for us to stratify our analysis according to attitude toward contracep-

tion among the racial groups. However, as the purpose of this paper was to look at birth rates and their trends over time, we hope that other studies can address the social etiologies of these trends.

Finally, our findings demonstrate variation in parity patterns among the main racial and ethnic populations in the United States. The results of this study may help care providers and health policy-makers formulate strategies that will serve as templates for optimizing resource allocation and thereby ensure the delivery of quality and equitable health services across the different racial/ethnic subpopulations in the United States. It is therefore noteworthy that women who are currently experiencing frequent childbearing, especially those of Hispanic origin, will require expanded health insurance coverage as a consequence.

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