ORIGINAL COMMUNICATIONS

LOW BIRTHWEIGHT IN AFRICAN AMERICANS: DOES INTERGENERATIONAL WELL-BEING IMPROVE OUTCOME?

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The primary antecedent of infant mortality is low birthweight. Vital statistics data have shown that women of low socioeconomic status, regardless of race, are at greater risk for delivering low birthweight infants; however, prevailing data show that black women of the same socioeconomic status as white women have a twofold higher risk of giving birth to an infant weighing <2500 g and a threefold risk of delivering a very low birthweight infant weighing <1500 g. There is also evidence that intergenerational effects on birth outcome exist. However, virtually all studies of the effect of socioeconomic status on perinatal outcome have been cross-sectional; the effect of sustained intergenerational well-being has not been measured. To address this gap, this study was designed to demonstrate that in an African-American population with sustained high socioeconomic status and equal risk factors, the birthweight distribution and other reproductive outcomes are the same as those for comparable US white populations. Preliminary findings are reported here. (*J Natl Med Assoc.* 1993;85:516-520.)

Key words • low birthweight • very low birthweight • perinatal outcome • socioeconomic status

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A number of studies have noted high infant mortality in the African-American population in the United States.[1-22] Infant mortality is inversely associated with socioeconomic status in both black and white populations[1-7]: the higher the social class membership of the mother, the lower the infant mortality rate.[7] The larger proportion of African Americans living in poverty is usually advanced to account for the excess infant mortality in the black population. Other factors frequently used to explain the high infant mortality relationship, in addition to lower income, are poor nutrition and less prenatal care obtained by low socioeconomic status mothers together with their frequent younger age and higher parity.[8-10]

Low birthweight is the most important correlate of infant mortality,[23,24] and so infant birthweight is viewed as an indicator of risk for infant mortality. As an indicator, low birthweight has been examined in relationship to term pregnancy[11,23] and to the extent of prenatal care received.[25] Analysis of US natality statistics using a bivariate (birthweight-gestational age) approach suggests that recent reductions in infant mortality are attributable to reduction in term low birthweight infants (<2500 g; >37 weeks), which could be the result of more effective antenatal care. The reduction of preterm low birthweight incidence (<2500 g; <37 weeks) has been less dramatic for all parturients and even less pronounced for African-American women. Such findings lead others to conclude that preterm birth rather than low birthweight is the primary cause of infant mortality in the US.[26-28]

A significant cause of infant death has been infection; this too has been related to poverty.[29,30] However, recent trends in postneonatal infant mortality (death between the ages of 4 weeks and 1 year) have indicated that mortality due to infection is decreasing.[16] This

decrease does not change the ratio of black-to-white infant deaths, suggesting that the higher infant mortality rate among African Americans is not due to higher infection rates. Investigators frequently attribute post-neonatal infant mortality more to social and environmental conditions rather than to low birthweight.

In an extensive analysis of perinatal mortality, Naeye attempted to correlate data for a variety of socioeconomic factors but found that a residual black-white difference persisted and appeared related to a higher infection rate in blacks. Such differences tend to promote speculation about biological differences connected with race despite the fact that risk tends to decrease with improved socioeconomic status condition.[8] Variables such as education, income, professional attainment of the household head, maternal age, parity, influencing nonobstetrical conditions, spousal eligibility for socioeconomic status cohort membership, and extent of prenatal care utilization are some factors compared in longitudinal black-white groups. Also, personal maternal behavioral variables, such as smoking, alcohol usage, exercise, and employment, that could influence birthweight have been considered.

Risk factors inherent to a group clearly affect perinatal outcome; several recent studies have been conducted to determine the extent that the elevated risk for low birthweight or preterm births in black mothers would persist after controlling for biological, behavioral and socioeconomic status factors.[1,12,13,26] Only one of these studies tends to show that increased risk factors account for essentially all of the poorer outcomes in African Americans.[26]

Two factors characterize these studies: they are ecological or cross-sectional in nature, and they all find excess infant mortality in the black population. Cross-sectional and ecological studies may attempt to equate black and white infant mortality by similar socioeconomic status rankings, but most studies are plagued by the relatively small numbers of blacks in middle and upper class positions. More importantly, these studies do not account for the length of time in social position. It can be argued that a "newly arrived" black middle class family would not necessarily have the same education, life-style, or class stability as a "third generation" middle class black or white family. Thus, there is a need for an African-American study population characterized by sustained high socioeconomic status, which would provide birth outcome data for comparison to a similar white group.

Cross-sectional and ecological studies do not provide the opportunity for exploration of any intergenerational effect on birth outcomes. If there is a racial intergenerational effect (such as low birthweight), previous studies have been inadequate. Those few studies that have examined perinatal outcome across generations have either excluded blacks or were conducted outside the United States.[31-33] Furthermore, the need to study intergenerational perinatal outcome effects in the American population has been recognized.[34] Given the cross-sectional nature of previous study populations, what seems needed to better answer questions is a longitudinal study of a black population characterized by sustained high socioeconomic status.

METHODS AND STUDY GROUP

To answer some of these questions, we are examining health data from blacks and whites of relatively high sustained socioeconomic status for second- and third-generation outcomes. The Meharry Cohort Study forms the foundation of our patient base. Four hundred seventy-two African-American former medical students matriculating at Meharry Medical College entered a longitudinal study between 1958 and 1965 to investigate the natural history of hypertension and atherosclerosis. An additional 235 former Meharry students (200 medical students and 35 dental students) have been included to increase the statistical power of the study analysis. Birth certificates, hospital records, and a questionnaire are being used to obtain reproductive data on the participants. The primary dependent variable is birthweight, but other perinatal outcome dependent variables are considered. Independent variables consist of factors relating to education, income, social status, and nonobstetric health entities.

The Meharry Cohort Study was begun in the late 1950s by John Thomas, MD, a cardiologist at Meharry Medical College, to obtain sociodemographic information and to make baseline cardiovascular assessments in blacks.[35,36] This group consisted of 519 third- and fourth-year Meharry medical students. Of these medical students, 472 volunteered to be a part of this study; 37 students were found to be hypertensive at the time and were not included although they remain accessible to our study. As stated earlier, the additional study group is comprised of 235 former medical and dental students from 1966, 1967, and 1968. Thus, our total cohort consists of 707 first-generation members.

The most persistent demographic feature shared by the former Meharry students is their educational attainment. All had at least 15 years education and virtually all had earned college degrees prior to their admission to Meharry. All graduated from medical/

dental school and became medically and economically successful practitioners of medicine or dentistry.

Continuous mail contact has been maintained with the Meharry cohort, and the group has been examined and compared with a similar white cohort at Johns Hopkins University School of Medicine (the Precursor Study). The two institutions have collaborated in comparing the two cohorts for the risk of hypertension.[37] However, for our study, we are indebted to Michael Bracken, PhD, of Yale University, who has arranged to share data from his cohort of 4000 + females for comparison with our group. His cohort is comprised of 80% white patients and 20% nonwhite patients. This study was conducted during the 1980s and parallels births to our second-generation cohort.[38] His data collection process also parallels ours and includes the following parameters: education, gestational age, perinatal outcome factors, race, socioeconomic status of head of household, and source of maternity care.

Any study involving the interrelatedness of perinatal and other health-care outcomes to socioeconomic status are extremely complex by their nature. Given this situation, we recognize that the success of the project can be no better than the quality of its data collection tool (questionnaire). It became crucial therefore to define precisely what the data tool should seek to answer and what form it should take. To accomplish this goal, a National Advisory Committee was formed, and a professional data collection group, Survey Research Associates Inc (SRA), was retained. Through mutual input, a questionnaire was devised consisting of demographics, pregnancy history, reproductive information, labor and delivery experience, and life-style.[39,40]

Information gathered from medical records and birth certificates was used as an additional source of patient information. For those failing to respond to initial data collection efforts, telephone interviews were conducted, and on-site interviews were arranged in participants' home cities as needed. The Meharry cohort has an established track record for its ability to retrieve data from its participants. Their annual response rate ranges between 85% and 90%.[41-43]

The data collection steps used in this study are summarized in the Figure. These eight data collection steps provide a "walk through" of the procedures involved and also takes into account the attrition that inevitably accompanies research of this type.

The sample size was tested to determine if the number of subjects in the study population is large enough to fulfill the specific aims of the proposal. Originally, the number of first-generation Meharry subjects in this study was approximately 500; if we reach 450 of these and assume that two offspring is the total fertility rate of this group, we expect 900 offspring to comprise the second generation. Most of these would not have yet passed through all of their childbearing years. Thus, we assume 1.5 to be the average number of children born to the second-generation members. This would result in a total expected number of 1350 subjects comprising the third generation of the Meharry cohort. However, as our study progressed, it became apparent that childbearing in the second generation of the cohort was not occurring as early as we had speculated. Hence, to help assure a total of 1350 third-generation offspring (grandchildren of the original cohort) and to satisfy statistical power, we enrolled the additional 235 medical and dental students who matriculated at Meharry for the years 1966 to 1968.

DATA ANALYSIS

This study attempts to answer the following question: Given the same educational background, psychosocial status, economic, and nonobstetrical factors, would the mean birthweight for black newborns be the same as that for whites?

Two major approaches are being used to analyze the data. In the first approach, the dependent variable is continuous and is distributed normally or approximately so; therefore, analysis of covariance (ANOVA) will be used to analyze these data.[44] This method will allow blacks and whites to be compared with respect to the corresponding perinatal outcome, ie birthweight, after adjusting for the presence of other factors.

The second approach is being used for noncontinuous dependent variables. This approach is being used when birthweight is dichotomized into two categories (low birthweight versus normal birthweight). The analysis will be done using contingency table methods. From these tables, adjusted odds ratios will be determined, and tests of their significance will be obtained using the Mantel-Haenszel chi-square statistic.[45]

PRELIMINARY FINDINGS

Data have been collected and analyzed for the first 189 former Meharry students (first generation); they reported 494 births. Of these 494 births, 57 (11.5%) were low birthweight infants and four (0.81%) were very low birthweight infants.

For white patients during this time period (1955 to 1965), the low birthweight rate was 7.2%; for nonwhite parturients, the low birthweight rate was 13.8%. During the same time period, the very low birthweight rate for

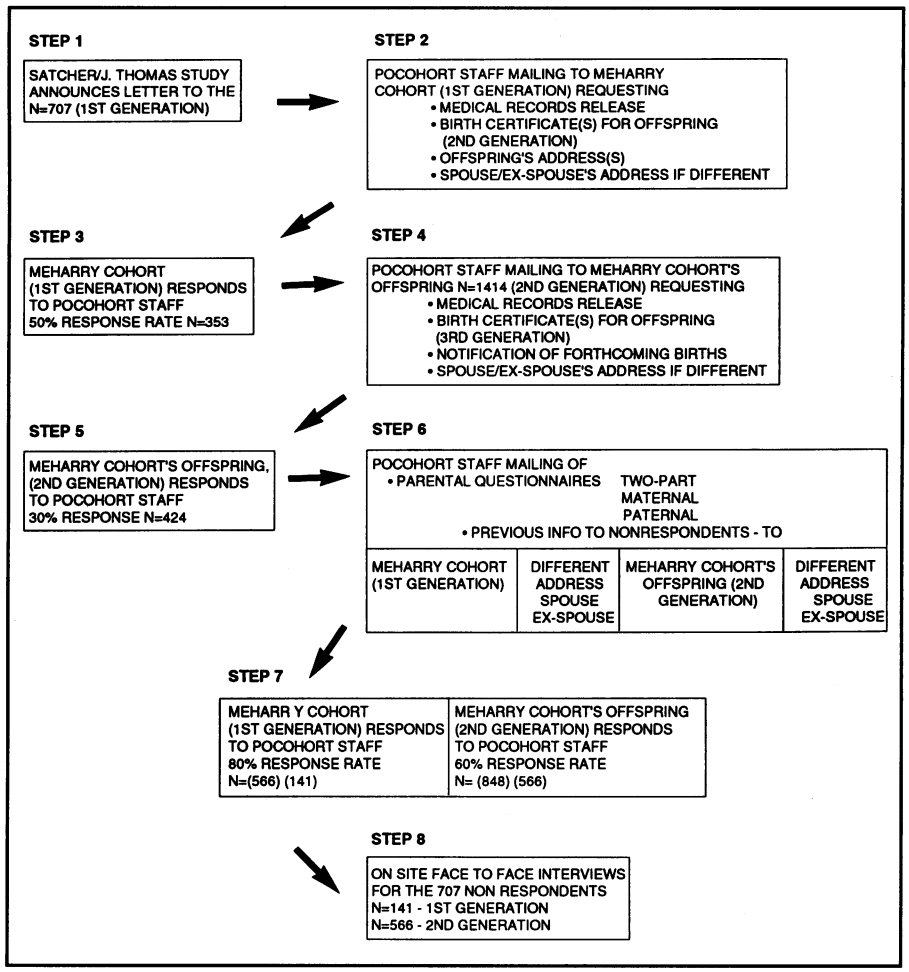

Figure. Chart outlining data collection steps to determine perinatal outcome in the Meharry cohort.

white parturients was 0.99% and 2.31% for nonwhites. The combined very low birthweight rate for both races was 1.16%.[46]

Births to the second generation (children of the Meharry cohort population) number 108 births (grandchildren of the original Meharry cohort). Of these, nine (8.3%) low birthweight infants were reported. There were no very low birthweight infants reported among these 108 births. National data collected in 1989 revealed a 5.7% low birthweight rate for white parturients, 13.2% for black parturients, and 6.2% for other nonblack parturients (Hispanic and Native American) during that same period.[47]

When final data analysis is conducted, whites and other nonblack parturients will be matched with blacks for equivalent socioeconomic status.

We anticipate concluding the present study in 18 months, depending on how supportive our Meharry graduates are in responding to us. At that time, we hope to substantiate our hypothesis that there is no significant difference in birthweight distribution among infants born to parents of the same socioeconomic status with the same risk factors irrespective of race.

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