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Race specific prenatal care demand and birthweight production in New York City

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RACE SPECIFIC PRENATAL CARE DEMAND and BIRTHWEIGHT PRODUCTION in NEW YORK CITY

by

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Abstract

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by

Geoffrey Lawrence Warner

Advisors: Professors Michael Grossman and Theodore Joyce

This dissertation estimates prenatal care demand and birthweight production of Non-Hispanic White women, Non-Hispanic Black women, and Hispanic women of any race who are bearing their first child. The goal is to determine the effect, if any, of prenatal care on an infant's weight at birth.

In estimating birthweight production and prenatal care demand, the effects of the mother's unobservable personal characteristics are controlled for using a technique recently developed by Robert Moffitt. Moffitt's innovation involves using time invariant observables to proxy for the unobservable characteristics. It is important to control for maternal unobservables because they may influence both her demand for prenatal care and the weight of her infant. A repeated cross-sectional approach is used. Successful application of Moffitt's technique will allow repeated cross-section data to be treated as panel data and permit the estimation of consistent prenatal care coefficients.

An additional innovation is the expanded definition of prenatal care. The majority of researchers investigating birthweight have used the

delay until the first prenatal care visit as an estimate of prenatal care demand and ignored the number of prenatal care visits. Some have used a modification of the Kessner index, which includes the number of obstetrical visits, to estimate prenatal care demand. The number of prenatal care visits is mechanically related to gestation. A pre-term birth necessarily means fewer prenatal care visits but not necessarily less prenatal care demand. This dissertation controls for gestation by comparing the observed number of visits to the number of visits recommended by the American College of Obstetrics and Gynecology, (ACOG), for a given gestation length. The results indicate that delaying the first prenatal care visit has an insignificant effect on the infant's birthweight. Reducing the number of visits has a significant detrimental effect on the infant's birthweight. Prenatal care delay and the number of prenatal care visits are substitutes in the production of birthweight. The results also indicate that controlling for maternal unobservables using Moffitt's technique improves the estimation of the effect of prenatal care demand on birthweight production.

TABLE of CONTENTS

I Literature Review

This dissertation investigates the health of newborns. The health of newborn infants has traditionally been measured by their mortality rates. The rate of death of infants aged from zero through 27 days, the neonatal mortality rate, primarily reflects an infant's genetic health. Infants with birth defects, such as malformed hearts, usually die within days of birth. Genetic engineering is needed to reduce this type of infant mortality. The rate of death of infants aged from 28 through 364 days, the post-neonatal mortality rate, reflects an infant's physiological health. Infants with less than fully developed lungs have difficulty meeting their body's oxygen needs which puts stress on the other internal organs. Several weeks of such stress may overwhelm the other organs, the heart in particular. A less than fully functional immune system leaves the infant vulnerable to potentially lethal viral and bacterial diseases or infections. These types of physiological weaknesses are associated with low weight and pre-term births. (The Centers for Disease Control defines a birth of less than 2,500 grams as low weight and a gestation of less than 37 weeks as pre-term. The normal weight for a first birth is between 3,300 and 3,400 grams. Normal gestation is 39 weeks long, (CDC, 1990)).

Infant mortality in the first year of life has been decreasing in the U.S. for decades. In the 18 years between 1964 and 1982 infant mortality declined at an annual compound rate of 4.5 percent, (National Center for Health Statistics in Corman and Grossman, 1985). Advances in hygiene and medical technology have prolonged the lives of many infants who would have otherwise died. Curiously, the rate of low weight and pre-term births has not decreased to the same extent. Medical advancement has saved the lives of weak infants after birth but has not improved the physiological strength of infants before birth. Recently, concern over health care costs has prompted a re-evaluation of neonatal care policy. The first question of interest is whether it is more cost effective to treat weak infants after they are born or to prevent the births of weak infants. The second question of interest is what are the important factors influencing the births of weak, ie. low weight and pre-term, infants.

Several different disciplines have investigated the incidence of low birthweight. Medical researchers take a physiological approach. For example, the majority of low weight births are the result of pre-term deliveries. Doctors have noted that a significant majority of pre-term births are boys. They attempt to answer questions such as how the uterus recognizes the sex of the fetus, and what the sex differences are that make a male fetus irritate the uterus more than a female fetus. Public health researchers take a rather sociological approach. They note that the incidence of low birthweight is much higher among poor, and especially non-white poor women than it is among higher income white women.

The questions of interest to them are of the advantages that wealthy women have over poor women, which ones both most significantly affect infant birthweight and can be most economically provided to poor women. Psychologists have also investigated the extent to which a woman's reaction to stressful life events affect birth-weight. Economists have investigated low weight births, treating the infant's weight as a good produced by its mother's reproductive organs and endogenous inputs such as prenatal care. This dissertation takes that approach.

Most of the physiological research is not relevant to this dissertation because cellular behavior is not subject to traditional economic analysis. However, research relating to the fetus' reaction to its mother's behavior, such as alcohol, tobacco, or narcotics consumption, or to how society treats its mother due to her race or ethnicity, is highly relevant.

Collins and David, (1993), investigated the genetic role that race plays in birthweight production. The authors compared the birthweights of two groups of bi-racial infants, (White mother/Black father and Black mother/White father), to one group of uni-racial infants, (White mother/White father). The data is singleton births to Black or White residents of Chicago during 1982 and 1983. Immediately there are problems with this data set because, as the authors correctly point out, Chicago is one those large U.S. cities where there is a very high degree of segregation in place of residence by race.

The correlation between race and socioeconomic variables related to place of residence may be so high that a meaningful separation of racial effects from other effects may not be possible. The authors confirm this in the statement that Black mothers of bi-racial infants were three times more likely to be single and five times more likely to live in a very low income census tract than the mothers of White infants. White mothers of bi-racial infants were similarly impoverished, being three times more likely to be single and three times more likely to live in a very low income census tract. They found that infants born to Black mothers and White fathers were 1.4 times as likely and the infants born to White mothers and Black fathers were equally likely as White infants to have a low birthweight. They interpret their results as suggesting that father's race is unrelated to the risk of low birthweight because the mother's socioeconomic characteristics explain much of it. However, since a Black mother's socioeconomic characteristics do not explain all of the risk for low birthweight, they suspect that there are unidentified detrimental factors in the Black woman's experience.

Becerra and Smith, (1988), investigated the effect that a mother's smoking had on the weight of her infant. The data came from a 1982 study by the Puerto Rico Fertility and Family Planning Assessment, (PRFFPA). It selected 4,500 households in Puerto Rico and examined the singleton hospital births of women between the ages of 15 and 49 of the selected households. Infants whose mothers started smoking regularly before pregnancy and were still smoking at the time of the study, ie. in 1982, were classified as smoking exposed. Infants whose mothers started smoking after pregnancy or had never smoked were classified as unexposed. Infants whose mothers started smoking before pregnancy but stopped before the study were excluded from the sample. The dependent variable was dichotomous, birthweight less than 2,500 grams and birthweight greater than or equal to 2,500 grams. Important independent variables are, all dichotomous, were the mother's age, mother's marital status at birth, mother's education, parity, and prenatal care use.

The results showed that women aged 20 years or older at time of birth who delivered in a public hospital and smoked during pregnancy were 2.5 times more likely to have a low weight infant than non-smoking women in the same categories. Teenagers who delivered in a public hospital and smoked during pregnancy were equally likely as non-smoking teens to have a low weight infant. Adult women, being older, have more opportunity to smoke for a longer period of time before pregnancy than do teenagers. These results imply that years of smoking before delivery may influence birthweight, but the authors found no significant correlation between years of smoking before delivery and low birthweight. Medically, it is possible that accumulated lung damage and tar accumulation in the lungs can reduce oxygen transfer to the blood. Reduced blood oxygenation may retard fetal growth.

Olsen, Pereira, and Olsen, (1991), investigated the interaction between tobacco and alcohol use during pregnancy. The data comes from a study conducted by Odense University in Denmark. Women in their 36th week of gestation and attending two Danish midwife centers completed detailed questionnaires relating to their smoking and drinking habits. Multiple births and births of less than 36 weeks of gestation were excluded. One of the analyses was a logistic regression of dichotomous birthweight, low versus non-low, on two categorical variables for amounts of smoking and drinking. The results indicate that a women drinking 120 grams or more of alcohol per week are more than twice as likely to have a low birthweight infant than non-drinking women in all smoking categories; non-smoking, 1-9 cigarettes per day, and 10 or more cigarettes per day. However, women drinking less than 60 grams of alcohol per week are less likely to have a low birthweight infant than non-drinking women in all smoking categories. The authors' results strongly suggest that only heavy alcohol consumption during pregnancy retards fetal growth. Light to moderate alcohol consumption does not adversely affect the fetus.

Bateman et al, (1993), investigated the effects of fetal exposure to cocaine on birthweight. The data consisted of singleton births at Harlem Hospital in New York City from

September 1, 1985 through August 31, 1986. The cocaine exposed infants were identified by maternal history or by infant urinalysis within four days of birth. A comparison of the two infant groups revealed that cocaine exposed infants weight an average of 460 grams less than non-exposed infants. The cocaine exposed infants had a low birthweight rate of 30.7%. The non-exposed infants had a low birthweight rate of 9.8%. The results of logistic regression indicated that cocaine exposed infants were 2.1 times as likely as non-exposed infants to be of low weight. When an infant was exposed to cocaine and some other illicit drug, the likelihood of low birthweight compared to a non-exposed infant rose to 2.6 times. Cocaine use clearly and significantly reduces birthweight.

Chasnoff et al, (1989), also investigated the effect of cocaine on fetal growth. Their research differs from Bateman et al in that Chasnoff et al are primarily investigating whether fetal cocaine exposure early in the pregnancy has the same effect on birthweight as entire term cocaine exposure. Northwestern University Medical School examined the cocaine use patterns of 75 pregnant women. Women who used cocaine in their first trimester only were defined as group 1. Women who used cocaine throughout their pregnancy were defined as group 2. Women who used cocaine in any other pattern were excluded from the study. Group 3 was for control. It comprised 40 women who did not use any drugs or alcohol throughout their pregnancy. The mean birthweight of the 39 full-term group 3 infants was 3436 grams. The mean birthweight of the 19 full-term group 1 infants was 3160, a deficiency of 276 grams. A test of the difference between two sample means does not indicate a significant difference at 1% level of significance. The mean birthweight of the 36 full-term group 2 infants was 2829, a deficiency of 607 grams. A test of the difference between two sample means indicates that this difference is significant at 1% level of significance. These results suggest that the influence of cocaine on fetal growth is dose related in that longer use, (more doses), results in lower birthweight. However the sample sizes in this study are not large enough reach such a generalizable conclusion.

Cann and Goldhaber, (1989), investigated the effect of caffeine on birthweight. Data came from Kaiser Permanente facilities in Northern California and consisted of women who used the facilities from July 1, 1981 through June 30, 1982. Three measures of caffeine consumption are used; none, light-to-moderate, and heavy. Additional independent variables are, ethnicity/race, alcohol consumption, cigarette consumption, pre-pregnancy weight, weight gain, and parity. A logistic regression was performed with low versus normal birthweight as the dependent variable. The results indicate that women with light-to-moderate caffeine consumption are not more likely than women with no caffeine consumption to have a low weight infant. Women with heavy caffeine consumption, (300 or more mg per day), are three time as likely than women consuming no caffeine to have a low weight infant. When the caffeine is consumed as a cola drink the odds ratio doubles to six. An important weakness of their study is the small sample size, 131 low weight births and 136 controls. This resulted in large standard errors; none of the odd ratios were significantly different from one. The results of this study can only be interpreted as a suggestion, not a conclusion, of a relationship between caffeine intake and birthweight.

Becerra et al, (1993), investigated the relationship between low birthweight and infant mortality in Puerto Rico. The data consisted of 257,537 live births to Puerto Rican residents for the years 1986 through 1989 and 3,373 corresponding infant deaths. Logistic regressions were performed on dichotomous variables for low birthweight and survival past the first year of life. The independent variables, all dichotomous, were maternal age, marital status, maternal education, hospital of birth, and amount of prenatal care. The results included the finding that mothers who received no prenatal care were twice as likely as mothers receiving at least some prenatal care to have a low weight infant. Infants who were low weight were 18 times more likely to die in their first year of life than normal weight infants. This study's results strongly indicate that low birthweight is an excellent indicator of mortality risk, and that the lack of prenatal care is a very good indicator of low birthweight. In fact, the odds ratio for prenatal care was the highest of all the independent variables.

The Institute of Medicine published a compilation of research on the prevention of low birthweight in 1985. It notes that areas with family planning clinics were associated with low incidence of low weight births. It feels that better use of family planning services, particularly by low income women, will significantly improve birth outcomes. In its review of the literature, the Institute noted that there was no consensus on the definition of prenatal care. The most common definitions were quantitative, dealing exclusively with the number of visits made and the timing of the first visit. Very few definitions had a qualitative component, dealing with the content of prenatal care. It was stressed that prenatal care is not one uniform intervention. Rather, it is many different interventions. The mix of interventions which makes up the whole of prenatal care, is, or should be, determined by the characteristics of the individual woman, (ie. her medical history), and her pregnancy. Prenatal care definitions also ignored the manner in which care was delivered.

The Institute identified three major delivery routes; private obstetrician-gynecologists, Health Maintenance Organizations, (HMO's), and public clinics. The manner of delivery is important because the degree of continuity of prenatal care differs markedly from one delivery route to the next. Private care has the highest degree of continuity. The mother has the same physician for the entire pregnancy, and the same physician for subsequent pregnancies. This type of continuity is important because the physician experiences the mother's medical history, complete with subtle nuances, as opposed to hearing it told to him or her. As well, the quality of emergency advice over the telephone will be much higher due to this continuity of care. There will generally be a lower degree of continuity with HMO physicians because the physician and patient have less autonomy in an HMO. While different HMO's have different policies, patients generally must see a primary care physician and be referred to a specialist. If an HMO classifies an obstetrician as a specialist, then a woman cannot directly access an obstetrician. In addition, as employees of an HMO physicians can be fired or transferred without the patients' input. Public clinics offer the least amount of continuity. Women will be examined by the obstetrician on duty at the time of the mother's visit.

The Institute identified a number of non-physical barriers to prenatal care. One was the low participation rate of obstetricians, relative to other physicians, in the Medicaid program. It feels that this is a major barrier to prenatal care access by poor women. It advocates the increased use of Certified Nurse-Midwives, (CNM's), in order to alleviate the shortage of care to women who have otherwise limited access. Women themselves are not passive objects in the prenatal care issue. Their experiences and attitudes impact on the amount of care they receive. Women need to know the symptoms of pregnancy and especially the symptoms of a problematic pregnancy. They need to know the importance of prenatal care and some of the important procedures, such as the determinations of blood pressure and blood sugar level, and urinalysis. They need to know the types of prenatal care facilities that can best help them and where they are located. Most important, women need to realize that prenatal care is useful and feel that the providers of care are supportive and pleasant. If women perceive a lack of caring or consideration on the part of the prenatal care providers, or feel that the care is too impersonal, then they may avoid further contact. This will, at best, cause some discontinuity in the delivery of care, and, at worst, may significantly delay the initiation of prenatal care and significantly reduce the frequency of visits.

The vast majority of the medical research on birthweight has focused on women. The male contribution to infant health has not been so extensively researched.

Zhang and Ratcliffe, (1993), studied the effects of paternal smoking habits on birthweight. The mechanism they investigated was not the effect of smoking on sperm health and in turn on fetal health. The authors focused on the effect of the fathers' second-hand smoke on mothers and the fetuses.

Lindbohm et al, (1991), investigated the effect of paternal exposure to workplace mutagens on the viability of the fetus. The data came from the Finnish Hospital Discharge Record which identified 99,186 spontaneous abortions between the years 1973 and 1982. There were three levels of mutagen exposure, high, low, and none. Exposure must have occurred during spermatogenesis, defined as within 80 days before conception. Other independent variables were mother's age, maternal exposure to harmful substances, and the couple's socioeconomic status. The results indicated that the odds of spontaneous abortion were not significantly greater for the fathers exposed to mutagens than for the unexposed fathers. These results suggest that fathers' health or behavior does not significantly affect the health of the fetus. Their other results were consistent with the results of investigations of maternal smoking on birthweight.

Maternal social characteristics have an impact on infant birthweight. Hansell, (1991), investigated how socio-demographic factors affect the quality of prenatal care. The data came from the 1980 National Natality Survey and the 1980 Fetal Mortality Survey. The prenatal care obtained, as documented in the surveys, measured by the performance of a blood pressure test, urine test, hematocrit test, was compared to the care recommended by the American College of Obstetrics and Gynecology, (ACOG). The quality of prenatal care was measured as the percent of total prenatal care visits in which the ACOG recommendations were met. The independent variables were maternal age, maternal education, maternal race, marital status, parity, and whether the mother lived in a metropolitan area. The results show that mother's age has no significant effect on the quality of prenatal care, mother's education has a significant positive effect on the prenatal care quality. Mother's race has an inconsistent effect on prenatal care quality. Non-Hispanic White and Asian women have their blood pressure taken and their urine tested for sugar and protein significantly more often than Hispanic White women, the control group. Married women receive significantly higher prenatal care quality than single women. Higher order infants receive significantly lower quality prenatal care. Women living in cities receive lower quality prenatal care.

Manderbacka et el, (1992), investigated the relationship between marital status and birthweight. The authors noted that in the years between 1960 and 1987 the proportion of Finnish births to unmarried mothers rose from 4% to 19%. They also noted that while the rates of infant mortality and low birthweight are significantly higher for unmarried mothers, the gap has narrowed in the past 25 years. The data was singleton births in 1987 in Finland obtained from the medical birth register. The independent variables included the mother's marital status, defined as married, co-habitating, or single, maternal age, maternal education, and parity. The results suggested that co-habitating women did not have a significantly higher probability of bearing a low birthweight infant than a married women, but single women were 1.6 times as likely to have a low birthweight infant than a married women. Co-habitating women did not have a significantly higher probability of bearing an infant who dies in the first year of life than a married women, but the child of a single woman was 1.5 times as likely to die in the first year of life than that of a married woman. The authors assert that marriage and co-habitating are associated with economic well-being or with a reduced uncertainty of economic support both of which benefit perinatal outcomes. They also assert that healthier women may be more successful finding mates than less healthy women. This would imply that married or co-habitating women are a healthier population than single women and consequently bear healthier children than single women.

Peoples-Sheps et al, (1991), explored the relationship between maternal employment and birthweight. The data came from the 1980 National Natality Survey and consisted of 2711 White singleton births to married women who worked during pregnancy. The workplace variables were the hours of work, (1 to 20, 21 to 39, greater than 39), whether the work was done outdoors, in extreme cold, in extreme heat, in poor ventilation, and whether the worker was subject to loud noises and physical hazards. Other independent variables included maternal age, maternal education, pre-pregnancy weight, and whether prenatal care was started in the first trimester. The results showed that women who worked 40 or more hours per week were 1.7 times as likely as women working 1 to 20 hours per week to bear a low birthweight infant. All the other workplace variables were insignificant. The authors' conclusion is that only working long hours during pregnancy is associated with low birthweight.

Culture has been considered a factor in determining birthweight. Schribner and Dwyer, (1989), investigated how Americanization affects birthweight among Hispanics. Hispanics of Mexican descent have infant mortality and low birthweight rates which are comparable to those of non-Hispanic Whites. This favorable perinatal outcome holds even when comparing Mexican Hispanics born in Mexico, (and living in the U.S.), to Mexican Hispanics born in the U.S. even though the former are generally of lower socioeconomic status than the latter. Data came from the Hispanic Health and Nutrition Examination Survey and three Hispanic groups, (Cuban, Mexican, and Puerto Rican), were identified. An acculturation variable, comprised of measures of language preference, ethnic identity, and place of birth, was used to proxy the degree of Americanization. Other independent variables were maternal education, household income, maternal age, urban residence, and parity. The results gave a coefficient on acculturation which was significantly positive. The acculturation variable was coded as dichotomous, 1 for a Mexican orientation and 0 for an American one. The interpretation of the coefficient is that Hispanic mothers who identify strongly with traditional culture are more likely to have a normal weight infant than are Hispanic mothers of Mexican descent who identify more strongly with American culture. The authors claim that traditional culture encourages better nutrition, fewer premarital births, lower rates of smoking and alcohol consumption, and a higher regard for parental authority and roles. The suggestion is that it is these cultural values which are behind the relatively favorable perinatal outcomes.

Helsel, Petitti, and Kunstadter, (1992), studied an Asian ethnic group, the Hmong. The authors compared the perinatal outcomes of 1937 Hmong infants born between 1985 and 1988 in California to 3776 Asian and 3776 White births, also Californian. The authors found that while Whites had significantly heavier infants and significantly longer gestations than the Hmong, (3452 grams versus 3311 grams, and 272.3 days versus 268.3 days). The Hmong did not have a significantly higher low birthweight rate than Whites. White mothers, (71.9% in first trimester), start prenatal care significantly earlier than Hmong women, (34.4% in first trimester). However, Hmong women, (0.7%), receive no prenatal care significantly less often than do White women, (2.1%). An interesting finding was that the Hmong women had a significantly lower rate of caesarean sections than did White women, 3.9% for the Hmong compared to 23.8% for Whites.

The large difference in the rates of cesarean sections coupled with the equivalent rates of low birthweight suggests that the Hmong 'manage' fetal growth, attempting to achieve an ideal birthweight. That ideal birthweight will be high enough to avoid unreasonable risk of infant death but low enough to allow a vaginal delivery. This strategy seems quite reasonable. For a healthy woman, a cesarean delivery is riskier and uses up more maternal health stock than a vaginal delivery.[1] It is unlikely that the average woman would demand so much prenatal care that she compromises her own health by means of a very large baby. It would be only in rare extenuating circumstances that a woman sacrifice her own health in order to increase that of her fetus.

Collins and David, (1990), attempted to explain the observed perinatal outcome differences between Blacks and Whites by means of differences in socio-demographic characteristics. Data came from the 1982 and 1983 Illinois Vital Records and the 1980 Census, the births of Chicago residents were examined. Mother's socioeconomic status was measured by the median family income and the percent of

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[1] Maternal health stock is defined as the functional ability of a woman's reproductive organs. With this definition the loss of maternal health stock varies with the type of cesarean section performed. A C-section performed using a low transverse incision allows the mother to deliver future pregnancies vaginally. A C-section using a classical or vertical incision so weakens the uterus that obstetricians feel that it will tear along the scar during a subsequent labor. This procedure permanently impairs the mother's reproductive organs in that they can no longer execute a vaginal delivery. This is a permanent loss of maternal health stock. There is no evidence to suggest that C-sections affect birthweight production.

families living in poverty in the mother's census tract of residence. Additional independent variables were marital status, maternal age, and maternal education. The results confirm that Blacks have twice the likelihood of bearing a low birthweight infant than do Whites. In almost all categories for age, education, and income level, the odds ratio was roughly 2. In only one category was the odds ratio 1; median family income greater than $40,000. The authors suggest that the intense concentration of violence, substance abuse, unemployment, and poor nutrition in low-income urban areas produces such a powerful negative force that it overwhelms any benefit that marriage, an education, or delayed child-bearing may bring.

Mayberry and Lewis, (1990), investigated the secular change, if any, in the rate of low birthweight. The birthweights of Black and White infants born in South Carolina in 1975-76 were compared to those of 1985-86. The data came from the Office of Vital Records and Public Health Statistics. The results were that there was marginal improvement in the mean birthweight of Whites, but that there was no improvement in the rate of low birthweight for either Blacks or Whites. There were changes in maternal characteristics. More women are completing high school, becoming single mothers, and having children after thirty years of age. The pattern of initiation of prenatal care was unchanged. Though higher education and higher rates of marriage have been associated with lower rates of low birthweight, indicating offsetting effects of the changes in maternal characteristics, the authors concluded that either the strategy for low birthweight reduction or its implementation have been flawed.

Li et al, (1990), also investigated the secular change in the rate of low birthweight, though among Asian immigrants. The authors compared the birth outcomes of immigrants from Southeast Asia in Washington state in 1980 to those of 1986. Data came from the Washington State Birth Certificates files. Independent variables included maternal age, infant sex, parity, start of prenatal care, paternal occupation, and method of delivery. The results were that there has been a significant increase in mean birthweight. However, this increase is due entirely to an increase in the rate of high birthweight, (> 3,500 grams). There was no significant change in the rate of low birthweight.

Research pertaining to the effect of the mother's psychological state, which the literature calls maternal psycho-social characteristics, includes an article by Homer, James, and Siegel, (1990). The authors explored the relationship between stress in the workplace and the risk of a low birthweight delivery. The birthweights of infants whose mothers worked during pregnancy in stressful jobs were compared to those of infants whose mothers worked during pregnancy in unstressful jobs. The stress in a particular job was determined by the degree of job control and the amount of job demands in that job. The amount of physical exertion required in a job was a separate variable. The degree of job control and amount of job demands were made dichotomous, high versus low, yielding four job stress categories. Data came from the National Longitudinal Survey of Labor Market experience, Youth Cohort, (NLSY). Women aged between 14 and 21 in 1979 were selected in that year from the NLSY and included in the sample if they had at least one singleton live birth prior to 1983 and had worked during the most recent pregnancy. Other independent variables included maternal race, maternal age, maternal poverty status, mother's education, maternal grandmother's education, substance use, month of initiation of prenatal care, and work-related physical exertion. An additional variable was the mother's attachment to the workforce, measures by her degree of motivation to continue working beyond age 35. The results were that work-related stress did not have a significant impact on the risk of low birthweight, or on birthweight at all, if the mother was strongly attached to the workforce. Among mothers who were weakly attached to the workforce, those in high stress jobs were eight times more likely to have a low weight birth than similar women in low stress jobs, and had a mean birthweight 499 grams less than the latter. The authors conclude that jobs characterized by high demands/low control adversely affected the birth outcomes of only, the relatively few, women who did not want to remain in the workforce.

Pagel et al, (1990), tested the hypothesis that social and psychological factors significantly influence pregnancy outcomes, after controlling for demographic, biomedical, and lifestyle factors. The sample consisted of 100 pregnant women recruited from the prenatal clinics of six hospitals in Seattle, WA. The women were from 21 through 36 weeks along in the pregnancy. The data came from a questionnaire which each women completed with an interviewer. The psycho-social variables were indices of stressful life events, social supports, and anxiety. Other independent variables included maternal age, marital status, height, pre-pregnancy weight, previous low weight births and spontaneous abortions, and smoking and alcohol consumption during pregnancy. Income and education were not used as explanatory variables.

The authors used a quasi-stepwise regression technique, with the psycho-social variables entering the regression last. They used the increase in the explained variation, (the coefficient of determination), to establish the significance of the variables. The results were that a higher number of life events before pregnancy was significantly associated with lower birthweight. No other psycho-social variables significantly influenced birthweight. The authors noted that women with poor psychosocial profiles, who reported high anxiety and low social support, were younger, had lower education, has less income, had more biomedical problems, and, most significantly, smoked more, than women who reported either low anxiety or high social support. It is possible that an individual under high stress may engage in more adverse behaviors, smoking, drinking, and substance abuse, than an individual under low stress. A pregnant woman under high stress may manifest her anxiety through such adverse behaviors and indirectly reduce the growth rate of her fetus. The apparent positive correlation between high levels of anxiety and adverse behaviors may be too high to allow an identification of a separate direct effect of anxiety on birthweight.

The medical, sociological, and psychological research cited above have one outstanding characteristic. The researchers all started with an hypothesis about a factor's or factors' influence on birthweight already in mind, gathered data, and then tested the hypothesis. This need not have been the case because these disciplines have strong theories which can lead to testable hypotheses.

Modern human physiology is determined by evolutionary processes. Evolutionary theory can be applied to the reproductive system to explain its current structure and operation, and, more relevant, to predict how reproductive physiology may change as a result of current evolutionary forces. The most important theories of evolution are those put forth by Charles Darwin, Alfred Wallace, and Jean Baptiste de Lamarck.[2] The natural selection theory, when applied to birthweight, results in the claim that infants of greater birthweight are more likely to survive and reproduce than infants of lesser birthweight. This leads to the hypothesis that men and women who themselves of above average birthweight will have children who are also of above average birthweight. This is called directional selection and geneticists have observed that it seldom results in an extreme level of an attribute. Rather some mean level of the attribute is established. This is referred to as stabilization selection.

Karn and Penrose, (1951), found that infants with a non-extreme birthweight had the lowest mortality rates. Cavalli-Sforza and Bodmer, (1971), superimposed a plot of birthweight specific mortality rates on a relative frequency histogram of birthweights. It showed a parabolic relationship. Mortality was highest at the low and high birthweights and lowest at an intermediate birthweight. They identified an optimal

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[2] Lamarck's, (1744-1829), theory states that the environment guides the evolutionary path. Environmental changes bring about behavioral changes in the organism, (say man). These behavioral changes bring about physiological changes due to some organs, structures, or physiological processes being used more or less than others. Organs experiencing greater use grow in size or complexity, while those experiencing less use grow smaller or disappear. These attribute changes are then passed on the subsequent generations.

Darwin, (1809-1882), and Wallace, (1823-1913), independently developed the theory of natural selection. Individual organisms within a species, (and across species as well), compete with each other for food, defense from predators. and mates. Those organisms who are most successful at surviving and mating pass their attributes on to subsequent generations.

birthweight, that birthweight with the lowest mortality rate, of approximately 7 lbs 8 oz, (3400 grams). The mean birthweight of their sample was 7 lbs 4 oz, (3300 grams). Stabilization selection suggests that the tens of thousands of years of human evolution may have more impact on birthweight production than the last several hundred years of midwifery and obstetrics.

The environmental adaptation theory, when applied to birthweight results in the claim that different mean birthweights should be observed in different environments or climates. An hypothesis might be that lower birthweights occur in cold climates and higher birthweights in tropical climates. A smaller body, (less surface area), conserves body heat, leading to greater survival likelihood in a cold climate and lesser survival likelihood in a tropical climate. This theory of evolution has particular relevance for North America because none of the racial groups examined in this dissertation are indigenous to this continent. The Caucasian race, which dominates the White sub-sample, evolved in Europe. The Negro race, which dominates the Black sub-sample, evolved in Africa. The Hispanic sub-sample is a mixture of the two above races and the race indigenous to the Caribbean and South America. The theory predicts that this migration will have an effect on birthweight. In addition, since industrialization, there has been a significant migration from rural areas to urban areas. The move from farm work within a low population density to factory work within a high population density may have a significant effect on birthweight production.

Evolutionary theory can also be applied at the molecular level. One characteristic of urban living is the respiration of elevated levels of carbon monoxide, CO, produced by the combustion of fossil fuels for cars and buses.[3] The body's adaptation to elevated CO levels may affect birthweight production.

The medical research cited above does not explicitly use evolutionary theory to develop testable hypotheses.

The psychology discipline concerns itself with explaining and predicting human behavior. Behavior can be biologically based, learned, or a manifestation of an individual's personality. The biological basis for behavior is very relevant for birthweight research because women experience significant hormonal change during pregnancy. Claims that the hormonal change during pregnancy cause the mother to engage in more positive behaviors and fewer negative behaviors can be made. The theory can generate the hypotheses that women with higher levels of prolactin smoke less and take fewer narcotics than women with lower levels of prolactin, or that women with elevated levels of oxytocin bear infants of lower birthweight, due to premature delivery, than women with lower levels of

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[3] Carbon monoxide, CO, is a tasteless, odorless, gas which competes with oxygen for attachment to hemoglobin molecules in the blood. Breathing CO lower blood oxygenation which, in turn, decreases the level of cellular activity.

oxytocin.[4]

The theories of perception, motivation, and learning can be used to formulate hypotheses about a mother's behavior and its subsequent effect on birthweight. For example, the signal-detection theory of perception predicts that the state of being pregnant changes the context in which a women experiences sensations, causes a change in the interpretation of those sensations, and ultimately causes a change in behavior. Maslow's theory of the hierarchy of needs is one of the most well-known theories of motivation.[5] It can lead to the hypothesis that women for whom pregnancy and motherhood satisfies more needs or to a greater extent, will engage in more positive behaviors and fewer negative behaviors than other women. Learning theories include operant conditioning, insight, and latent learning. How parents learn about pregnancy, in terms of degree of rewards or reinforcement and degree of insight, affect how they behave towards the pregnancy.

Theories of personality traits can also generate hypotheses regarding prenatal care demand or birthweight

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[4] Prolactin is a hormone, produced by the pituitary gland, which regulates milk production in mammals. In lower mammals, such as rats or mice, it also influences maternal behavior. Oxytocin is also a pituitary hormone. It stimulates labor and lactation.

[5] Maslow's hierarchy of needs, from lowest to highest, are; 1) physiological needs, 2) safety needs, 3) love and belongingness needs, 4) esteem needs, 5) self actualization needs.

production. Personality dimensions, such as introversion versus extroversion or experimenting versus conservative, may be highly correlated with behaviors affecting prenatal care demand or birthweight production. The psychological research cited above does not explicitly use psychological theory to generate testable hypotheses. However, research on the effect of hormonal changes on behavior may be technically overwhelming to persons who are not clinical psychologists and restricted to highly specialized journals.

The sociology discipline has three major paradigms, under each of which, a expecting mother's behavior can be analyzed. The Structural-Function paradigm assumes that society is a complex system whose parts work together to promote stability, (Macionis, p. 17). This paradigm can generate theories regarding the role of pregnant women in society. For example, pregnant women can be that part of society which promotes stable population growth. An hypothesis might be that the degree to which a woman understands or accepts this role significantly influences her behavior during pregnancy, and, in turn, the infant's weight at birth. The Social-Conflict paradigm assumes that society is a complex system characterized by inequality and conflict which generates social change, (Macionis, p. 19). This paradigm generates hypotheses concerning the distribution of society's resources. An hypothesis might be that the power of pregnant women, relative to other groups in society, significantly influences the amount of resources available to pregnant women for prenatal care, or for education and living standards especially relevant to pregnant women. The two above mentioned paradigms are macro-sociological in nature. They deal with society's group rather than its individuals. The Symbolic-Interaction paradigm has a micro level orientation. It assumes that society is continually recreated as its individuals construct reality through interaction, (Macionis, p. 21). An individual' perception of how society is treating him or her and the context in which this interaction takes place causes that individual to change his or her behavior. This paradigm when applied to birthweight production leads to a theory that differences in how women perceive society treating them, perhaps due to their observable characteristics, causes differences in their behaviors. The sociological research cited above does not explicitly use sociological theory to generate testable hypotheses.

The economics research, as evidenced by the articles cited below, takes a different approach from other research. Economists view observed human behavior as the best behavior from among several alternatives given the circumstances. The term 'best behavior' should be interpreted as meaning that behavior which makes the individual in question as well off as possible. The economics discipline sees human behavior as the result of individuals considering a set of behaviors, deciding upon a subset of feasible behaviors which satisfy the unique constraints imposing upon that individual, and choosing that feasible behavior which maximizes that individual's well-being or utility. Economists model human behavior under the paradigm of rationality; each individual is capable of evaluating whether one behavior makes him or her better off than some other behavior and conduct this evaluation consistently over all possible behaviors. In contrast to the forementioned disciplines, economics starts with a model and the principle of utility maximization. It is the model which generates the hypotheses to be tested. It is the model which is rejected or not rejected as being an acceptable tool for explaining the behavior of interest. Economists model the behavior of prospective parents and investigate whether their behavior encourages, discourages, or is neutral to the growth of the fetus. The research of the non-economics disciplines cited above seem not to have acknowledged the existence of a paradigm from which models can be developed and, in turn, predictions made.

Corman and Grossman, (1985), investigated the determinants of neonatal mortality rates, the rate of infant deaths aged 0 through 27 days. If parents feel better off when their children survive then their behavior should reflect this. Parents would engage in more of the positive behaviors and fewer of the adverse ones, subject to their constraints. The authors regressed neonatal mortality rates, the average for the three years 1976-78 inclusive, on a number of parental and environmental characteristics, also the average for the same years. The regressions were race specific. Data came from the National Center for Health Statistics Mortality Tape and the 1980 Census. The unit of observation was the county. Independent variables included the proportion of women in poverty, the proportion of women with high school educations, the county's Medicaid eligibility, family planning clinics, abortion providers, WIC eligibility, and the number of neonatal intensive care units. The results indicated that the most important factors in reducing neonatal mortality were the number of neonatal intensive care units for both Blacks and Whites. For Blacks, but not Whites, the number of abortion providers and community health centers were important. For Whites, but not Blacks, the number of family planning clinics, and the proportions of poverty and high school education were important. The Medicaid variables generally had the correct signs but were marginally significant.

Rosenzweig and Schultz, (1983a), investigated infant mortality, 0 through 364 days of life. They also follow an economic framework, parents engage in behaviors which improve the likelihood of the survival of their children. One factor influencing the survival of an infant is its health endowment. The authors believe that if parents were aware of or could otherwise guess their child's health endowment, then they would increase their helpful behaviors in an effort to compensate for a low health endowment. This would make parental behaviors endogenous to the likelihood of survival or, conversely, the infant mortality rate. A linear probability model was estimated, both by ordinary least squares and two-stage least squares to account for the endogeneity. A dichotomous mortality variable was regressed on prenatal care delay, parity, maternal age, smoking, maternal race, and infant's sex. Data came from the National Natality Followback Surveys for the years 1967-69. The two-stage least squares results indicate that higher order children have less risk of mortality than infants who are first or second born, waiting longer to start prenatal care increases the risk of mortality, infants of older mothers are at more risk than infants of younger mothers, longer breast feeding reduces the risk of mortality, delaying the return to work after birth also reduces the risk of mortality, boy infants are at higher risk of mortality than girl infants. In linear probability models the errors are heteroscedastic resulting in standard errors which are overstated and t scores which are understated, making the t scores less reliable.

Joyce and Grossman, (1990), investigated the relationship between pregnancy wantedness and prenatal care demand. Mothers who want a child and intentionally become pregnant would be expected to engage in more behaviors which enhance infant survival such as start prenatal care earlier, following the economic model of parental behavior. The authors regressed the decision to induce pregnancy termination on a number of parental and environmental characteristics using the maximum likelihood method. The result of this regression allows the calculation of the inverse Mill's ratio for each woman which is used as an independent variable in the prenatal care demand equation. Data on births and abortions came from the 1984 New York City Vital Statistics. Data on abortion providers, poverty rates, family planning clinics, and prenatal care clinics came from the 1980 U.S. Census, New York City Department of Health, and the Alan Guttmacher Institute. The results show that the residuals of the birth probability equation are negatively correlated with those of the prenatal care delay equation. It is interpreted as mothers with a higher degree of wantedness start prenatal care earlier. However, this relationship was significant only for Blacks and Hispanics, it was not significant for Whites. The authors speculate that racial differences in the use of abortion and contraceptive services explain the lack of correlation for Whites. If Whites manifest lack of wantedness by effectively using contraceptives, more effectively than Blacks or Hispanics, and thus avoiding becoming pregnant, then the use of abortion services would be less correlated with wantedness for Whites than for non-Whites. These results suggest that Whites have fewer unwanted pregnancies than non-Whites, and consequently obtain early prenatal care in a larger proportion of their pregnancies than do non-Whites.

Rosenzweig and Schultz, (1982), investigated the relationship between maternal behavior and infant birthweight. A woman's behavior during pregnancy, such as the start of prenatal care, tobacco and alcohol consumption, nutrition, and physical activity, are determinants of the outcome of the birth, such as the infant's weight. As in Rosenzweig and Schultz, (1983a), the authors assert that mothers have knowledge about their own health endowments which researchers do not have and that they act upon or use this knowledge when deciding when to start prenatal care or how many cigarettes to smoke. Mothers who do not see themselves as especially healthy may compensate for their deficiency by smoking less or starting prenatal care earlier. Two-stage least squares estimation is used to control for this remedial behavior. Data came from the National Natality Followback Surveys for the years 1967-69 and included only singleton births to married mothers. The two-stage least squares results indicate that delaying the first prenatal care visit significantly decreases infant birthweight as does smoking during pregnancy. Higher order births have significantly higher weights than lower order births. Maternal age does not significantly affect birthweight.

Rosenzweig and Schultz, (1983b), repeat their investigation of 1982. Differences are that non-linear functional forms are estimated and the three-stage least squares method is used in addition to ordinary least squares and two-stage least squares. The results for the Cobb-Douglas form estimated by both 2SLS and 3SLS are consistent with their 1982 results. In addition to estimating a birthweight production function, the authors empirically investigated their remedial behavior hypothesis concerning a mother's demand for the inputs for birthweight production. The influence of independent variables which are omitted from a regression equation is contained in the residuals. Therefore, the effect of the unobserved health endowment is contained in the residuals of the birthweight production equation. If mothers do indeed behave remedially towards their infants, a regression of the mother's behaviors, such as the demand for prenatal care, on these residuals should yield a significantly negative coefficient. The authors caution that because a random error component is also present in the residuals, the health endowment is, in effect, measured with error. Therefore the coefficient of interest is subject to the errors-in-variables bias, biased towards zero but carrying the correct sign. The results show that there is remedial maternal behavior. Births with negative residuals, (low endowment), were associated with early prenatal care. In addition, births with positive residuals, (high endowment), were associated with higher parity. Maternal smoking behavior was not significantly correlated to the residuals.

Corman, Joyce, and Grossman, (1987), investigate the effect of prenatal care on the neonatal mortality rate. For the reasons given by Rosenzweig and Schultz, (1983a, 1983b), prenatal care demand is endogenous to birthweight and mortality production. The authors estimate the mortality rate using 2SLS. Four endogenous variables, prenatal care, abortion, neonatal intensive care use, and birthweight, are estimated in the first stage. Birthweight is included in the second stage as an explanatory variable as a means of controlling for the unobserved health endowment, since lower birthweights are associated with lower endowments. Other independent variables were the participation in the maternal nutrition program, (WIC), smoking, and community health centers. Data came from the National Center for Health Statistics Mortality Tape and the 1980 Census. The unit of observation was the county. The results showed that WIC participation, use of abortion, and use of prenatal care significantly reduced the neonatal mortality rate. Smoking significantly increased it. A test of exogeneity was significant when the birthweight variable was excluded from the OLS equation and insignificant when included. The incidence of low birthweight appears to be an effective proxy for the unobserved health endowment. When birthweight was included in the 2SLS equation, the coefficients on WIC and prenatal care became insignificant. The authors interpret this to mean that prenatal care, and WIC, reduce neonatal mortality solely by reducing the proportion of low weight births.

Rosenzweig and Schultz, (1988), investigated whether the parameters of the birthweight production function were constant over time. In particular, the authors tested whether the impact of maternal smoking on birthweight for a 1980 dataset was the same as that for a 1967-69 dataset. The smoking habits of pregnant women changed over the twelve year interval. A decline in maternal smoking of 20%, (or one cigarette per day), was noted. Data came from the National Natality Surveys for 1980 and the years 1967 through 1969. Birthweight was regressed onto the delay until the first prenatal care visit, smoking, parity, race, and mother's age using both OLS and 2SLS estimation methods for Linear and Cobb-Douglas specifications. The results are ambiguous. The race coefficient was stable in all cases. The age coefficient declined for the OLS estimation and increased by a factor of two for the 2SLS estimation. The parity coefficient was stable for the linear specification but not for the Cobb-Douglas specification. The smoking coefficient was stable for the OLS estimation and decreased by half in the 2SLS estimation. The prenatal care coefficient was stable and insignificant in the OLS estimations, stable in the 2SLS Cobb-Douglas estimation, doubled in the 2SLS linear estimation. The claim of stability of coefficients appears inconclusive. Regarding the smoking coefficients, the authors suggest that the decline in the 2SLS estimates can be a reflection of pregnant women's switch to less harmful cigarettes, those brands with lower tar and nicotine content.

Rosenzweig and Schultz, (1991), examined the distribution of medical services among pregnant married women in 1980, and how it is effected by income tax rates, transfer payments, insurance policy, and the mother's socio-economic status. Data came from the 1980 National Natality Survey. Unmarried mothers were excluded from the survey, creating the potential for sample selection bias. The authors regressed each of eight dependent variables on race, parental education, father's income, and the mother's health endowment. The dependent variables of interest are the amount prenatal care delay and the number of prenatal care visits. The mother's health endowment cannot be observed. It was approximated by the residuals of the 2SLS estimation of a birthweight production equation. Their results were that a large health endowment increases prenatal care delay but has no effect on prenatal care visits, higher parental education leads to more prenatal care, Blacks receive less prenatal care than Whites, and higher father's income increases prenatal care use.

While this dissertation does not address the effect of fathers' health on birthweight, it does address the effect prenatal care of birthweight. What is extremely relevant, but unfortunately is not addressed by current research, is whether mothers adjust their prenatal care demand in response to their perceptions of their mates' health. In other words, if mothers act remedially with regard to their own behaviors and health endowments they may also act remedially with regard to their partners' behaviors and health endowments.

II INTRODUCTION

This dissertation investigates the health of newborns. As seen above, the health of a newborn infant is highly correlated with, and so is measured by, the weight of the baby at birth. The focus is on the inputs to birthweight production, prenatal care in particular.

The research that economists have done was all based on single cross-sectional data. One of the weaknesses of a cross-sectional approach is that its results are only valid for the point in time at which the data is gathered. Changes over time are ignored. Cross-sections at different points in time cannot be compared unless the function being estimated is stable over time. A repeated cross-sectional approach would help account for birthweight differences caused by time-related factors.

An example of such a time-related factor is the state of medical technology. The development of ultra-sound technology and the spread of its use by obstetricians may affect the demand for prenatal care.

A second example of an important time-related factor in NYC is the development of crack cocaine and the spread of its use. The abuse of controlled and uncontrolled substances is a fact of life. The existence, availability, or popularity of a particular substance changes over time.

In this study only first births are examined. The knowledge gained from and the experience of the first child born changes how a mother behaves during subsequent pregnancies. This makes prenatal care demand during subsequent pregnancies qualitatively different from the prenatal care demand of a first pregnancy. All other things being equal, a mother in her second or third pregnancy is necessarily older than she was in her first. Examining all births to a mother would skew the sample towards adults because teenagers have less opportunity than adults to bear more than one child.

The first pregnancy carried to term is not necessarily the first pregnancy, due to spontaneous or induced abortions. While recognizing that abortion affects the sample composition, this paper will not address any of the issues which abortion raises. The sample selection effects on birthweight due to induced abortion have been studied by Grossman and Joyce (1990).

The goal of this dissertation is to obtain consistent estimates the of parameters of the birthweight production function. Special focus is put on the coefficients of prenatal care demand. The coefficients on prenatal care demand are inconsistent in an OLS regression because a mother's unobservable characteristics, such as her health endowment, influence her prenatal care demand as well as the weight of the baby. With true panel data the effect of such unobservables can be differenced out because the same individual is being observed over time. Consistent estimates can then be obtained. This cannot be done with pseudo-panel data or repeated cross-sectional data because different individuals are being observed over time. Moffitt's technique of controlling for unobservables is to make them observable. Different individuals are still observed over time, but now one can see how those individuals differ. This step allows consistent coefficients to be obtained from OLS regressions on repeated cross-sections.

Section III of this paper discusses the development of the model. Section VI discusses the data set and the estimation method. Section V discusses the results of the regressions. Section VI summarizes the main conclusions and mentions some policy implications.

III Analytical Framework

In a time series data set, one can have a series of observations over time on the same individual, panel data, or on different individuals, repeated cross-sectional data.

In the series of observations on a particular individual, there are unique characteristics of that individual which do not vary from observation to observation over time, called fixed effects. If these fixed characteristics are observable there is no problem since those variables can be included in the regression. If these fixed characteristics are unobservable and correlated with the included explanatory variables then it needs to be differenced out of the data before the regression is done. This step is necessary because the unobserved fixed effect will manifest itself through the disturbance term, biasing the coefficients of those explanatory variables with which it is correlated.

For example, let

$Y = X\beta + u$ where $u = f + e$ and f = fixed effect

e = disturbance

The estimate of the coefficient is

$$\hat{\beta} = (X'X)^{-1}X'(X\beta + f + e)$$

$$\hat{\beta} = (X'X)^{-1}X'X\beta + (X'X)^{-1}X'f + (X'X)^{-1}X'e$$

where $E(X'e) = 0$ and $E(X'f) \neq 0$

$$E(\hat{\beta}) = \beta + \text{bias (due to the unobservable fixed effect)}$$

In repeated cross-sectional data, there are series of observations over time, not on the same individual, but on the same type of individual. The same type of individual means individuals having similar observable characteristics, such as all working full-time in a given week, all having obtained a graduate degree in a given year, or all having borne a child in a given year. However, the fact that individuals have similar observable characteristics does not guarantee that their unobservable personal characteristics, the fixed effect, are similar enough to be differenced out.

Robert Moffitt (1993) has developed a method of modelling each individual's fixed effect by assuming it depends on a set of that individual's time invariant characteristics such as year of birth. Including this set of variables in the regression equations holds the unobserved fixed effect constant. One drawback is that if variables in this set are also in the set of explanatory variables, their individual effects will be indistinguishable from those of the fixed effect. Still, this method effectively removes most of the fixed effect from the disturbance term. His method is only possible with repeated cross-section data. In a single cross-section data set year, age, and cohort form a mathematical identity, in that any one can be calculated from the other two. In a repeated cross-section data set there is no longer perfect collinearity between any two of the three above variables. This permits the inclusion of all three variables in one regression equation. The age variable can then serve as an instrument for prenatal care, so long as mother's age is not correlated with birthweight.

Moffitt's technique controls for unobservables to the extent that such unobservables are correlated with their proxies, say cohort. This would control for <u>inter</u>-cohort variation. Variation in mothers' unobservables within a cohort, intra-cohort variation, would still remain to bias the coefficients. Total bias is reduced, allowing the estimation of, at least, less biased coefficients on the prenatal care variables.

In sum, this is an approach, in which time invariant variables serve as an instrument for the unobserved fixed effect. There is no theory to guide the selection of those particular time invariant variables to serve as the best instruments. In fact no theory is necessary since the purpose of the instrumentation is not to explain the variation in fixed effect among different individuals but rather to describe it.

The first model contains an equation to estimate prenatal care demand and an equation to estimate birthweight production. These equations do not include variables to proxy for the fixed effect. The prenatal care coefficients in the non-fixed effect birthweight equation are expected to be inconsistent.

(1) $m_i = \alpha_1 y_i + u_{1i}$

(2) $n_i = \beta_1 y_i + u_{2i}$

(3) $b_i = \gamma_1 x_i + \gamma_2 m_i + \gamma_3 n_i + \gamma_4 (n/m)_i + u_{3i}$

The second model is the same as the first except variables to proxy for the fixed effect, the z variables, are included. The prenatal care coefficients, γ_1, γ_2, γ_3, and γ_4, in the fixed effect birthweight equation are expected to be consistent.

$$(4) \qquad m_i = \alpha_1 y_i + \alpha_2 z_i + e_{1i}$$

$$(5) \qquad n_i = \beta_1 y_i + \beta_2 z_i + e_{2i}$$

$$(6) \qquad b_i = \gamma_1 x_i + \gamma_2 m_i + \gamma_3 n_i + \gamma_4 (n/m)_i + \gamma_5 z_i + e_{3i}$$

In Moffitt's framework, the underlying disturbance term of these two models is composed of a sub-disturbance which varies predictably by individual, a sub-disturbance which varies by year, and a sub-disturbance which varies unpredictably by individual. It is presented algebraically as follows:

$$\epsilon_{ict} = f_c + g_t + e_i \ ,$$

where f_c is the predictable individual sub-disturbance and is captured by fixed effect variables.

where g_t is the year sub-disturbance and is captured by year dummies.

where e_i is the unpredictable individual sub-disturbance and is not captured.

The disturbance term, u, of equations (1), (2), and (3) is composed of the f and e sub-disturbances. The sub-disturbance g has been removed by year dummies. The disturbance term of equations (4), (5), and (6) is composed of only the e sub-disturbance. The f sub-disturbance is removed by the fixed effect variables, and the g sub-disturbance has again been removed by year dummies.

Problems remain when the fixed effect variables are the mother's cohort. Only the inter-cohort part of the f sub-disturbance is captured by the cohort variables, which proxy for the fixed effect. The intra-cohort part remains. This intra-cohort variation includes some of the variation in health endowment and forms part of the e sub-disturbance. Prenatal care demand is, therefore, still correlated with the disturbance term in equations (4), (5), and (6).

The Two-Stage Least Squares (2SLS) method of estimation is used to deal with this correlation problem. Predicted prenatal care demand is estimated in the first stage. Predicted prenatal care demand then enters the birthweight equation, the second stage, as a regressor and is uncorrelated with the disturbance term.

By including the fixed effect variables in the prenatal care demand equation, better predicted prenatal care values can be obtained, in that the first stage regression will explain more of the observed variation by accounting for or controlling for more of the mother's health endowment. Predicted prenatal care values which are closer to observed values and still uncorrelated with the mother's health endowment will result in a more accurate, (ie. smaller variance), coefficient on predicted prenatal care demand in the birthweight equation.

Prenatal care has two measures. The first, m, is the time interval, in days, between conception and the first prenatal care visit. The second, n, is the total number of prenatal care visits made. Previous research into birthweight has generally not included the number of prenatal care visits in the measure of prenatal care demand. This is a serious deficiency because a woman who see an obstetrician once in the first trimester and once again in the last trimester is not getting the same amount of care as a woman who visits four times in the second trimester and six times in the last trimester, even though no times in the first trimester. The dangerous assumption behind using only the timing of the first prenatal care visit as a measure of prenatal care demand is that all women use obstetrical services at the same rate. Some studies have used the Kessner index, or a modification of it, as an indicator of the adequacy of prenatal care. A serious problem is that the number of prenatal care visits is mechanically related to gestation. The longer the term the more opportunity to visit an obstetrician. This correlation must be controlled for if the effect of visits on birthweight is to be free of the influence of gestation on birthweight. This is an important factor because gestation is highly correlated with birthweight. The medical literature has found that two-thirds to three-quarters of low weight births are pre-term, (gestation less than 37 weeks).

In this dissertation, gestation will be controlled for by comparing the observed number of visits a mother made to the number recommended by the American College of Obstetrics and Gynecology, (ACOG), for the term length of her pregnancy. The ACOG recommends that a pregnant woman visit her obstetrician once every 4 weeks from conception until week 28, then once every two to three weeks until week 36, and once every week there after until birth. This results in a total of 14 visits for a full-term birth, (39 weeks), excluding the pre-conception visit. The proportion of recommended number of visits made by the mother is calculated as the observed number of visits divided by the recommended number of visits. For example, if a mother delivered after 37 weeks of gestation, the recommended number of visits would be 12. If she made 10 visits the value of the dependent variable for that birth would be 10/12 or 0.8333. Equations (2) and (5) model the standardized number of prenatal care visits, the predicted value of which will enter the birthweight production equation. It represents the number of visits a mother would have made had she had a full-term delivery. It is calculated by multiplying the recommended number of visits associated with a full-term delivery, (14), by the proportion of recommended visits that the mother made. For the above mother that number would be 11.67 visits. This method of measuring prenatal care is preferable to the Kessner index because it allows the identification of the independent effects of delay and visits on birthweight production.

Kotelchuk, (1994), has criticized the Kessner index, arguing that it is too heavily weighted towards the delay until the first prenatal care visits and does not adequately account for missing prenatal care values. He has developed a similar index which has two dimensions, adequacy of prenatal care initiation and adequacy of the number of visits. The number of visits is adjusted for both the timing of the first prenatal care visit and the timing of the birth. Visits missed due to late initiation of prenatal care are assumed to not be made up.

The Kessner and Kotelchuk indices share common weaknesses. The categorization of the quantitative variables of prenatal care delay and prenatal visits, (the qualitative aspect, its content, of prenatal care is ignored), into the qualitative variable of adequacy of prenatal care is subjective. Kotelchuk post-tests his index by comparing the rate of low birthweight to the adequacy of prenatal care. He obtains the predicted U shape relationship, low birthweight rates are highest at inadequate utilization of care and over-utilization of care. (Over-utilization of prenatal care is indicative of a problematic pregnancy.) However this doesn't erase the subjectivity of the categorization.

In addition, prenatal care is only one of several inputs to birthweight production. Other inputs are the mother's health endowment and her behavior during pregnancy. These other inputs need to be held constant for prenatal care adequacy to be comparable across mothers. For example, a mother who has had two miscarriages before her first live birth has a different standard of adequacy of prenatal care than a mother who has had no miscarriages before her first live birth. The two indices imply a uniform standard of adequacy for all mothers.

The usefulness of the indices lies precisely in its subjective standard of prenatal care adequacy. The statement that a women had 16 visits over a 38 week pregnancy with the first visit 9 weeks after conception is very dry, particularly for those who lack a frame of reference, (lay persons). For knowledgeable health workers, who are capable of making their own judgements, dry figures may be preferable.

There is little knowledge regarding how the first prenatal care visits delay and the number of prenatal care visits operate together as inputs in birthweight production. They may be substitutes, complements, or neutral. There has not been any empirical research focusing on whether subsequent frequent visits can compensate for delay in initiating prenatal care, or whether early initiation of prenatal care needs follow up visits to be beneficial. An interaction term, the n/m variable, is included in the birthweight production equation to measure the degree of substitution or complementarity, if any exists. It is constructed to increase or decrease as prenatal care use increases or decreases, respectively. It is calculated by dividing the standardized number of prenatal care visits by the days of delay until the first prenatal care visit. A positive coefficient would indicate complementarity, a negative one substitution, and an insignificant coefficient would indicate neutrality. It is important to investigate this relationship because of the policy implications regarding low birthweight prevention. Substitution implies an either/or option; start prenatal care early or visit the obstetrician often. Complementarity implies the lack of options; start prenatal care early and visit the obstetrician often.

The inclusion of an interaction term also changes the interpretation of the coefficients on visits and prenatal care delay variables. Without an interaction term the coefficients on prenatal care are equivalent to the marginal birthweight product of prenatal care, the derivative of the birthweight production equation with respect to prenatal care. With the interaction term this equivalence is lost. The marginal birthweight product of a prenatal care variable will be composed of a direct, independent effect measured by its own coefficient, and an indirect effect dependent on the levels of the prenatal care variables and measured by the coefficient on the interaction term. The marginal birthweight products of the delay in prenatal care initiation and the number of prenatal care visits follow.

$$\partial b/\partial m = \gamma_2 \,.\, \gamma_4(-n/m^2)$$

$$\partial b/\partial n = \gamma_3 + \gamma_4(1/m)$$

The prenatal care regressors, the y variables, are income and availability measures. Income in this paper has the sense of full income, including non-monetary household production as well as money earnings. The variables used to measure income are the mother's and father's education, the method of financing the birth, the unemployment rate, and the race-specific poverty rate. Parent's education, especially mother's education also measures non-market income. Greater education is presumed to lead to greater efficiency in household production. The variables which measure availability are the number of prenatal care clinics and the number of family planning clinics. The variables which capture other demand determinants are the mother's age and her marital status. Marital status may also capture some income effect.

The mother's health endowment can significantly affect prenatal care demand. A woman who has had no chronic or serious health problems in her life may not feel as strong a sense of urgency about obtaining early prenatal care than a woman who does have chronic or serious health problems. The researcher has no means of observing and adequately quantifying the state of a woman's health up to her first birth. A woman's health endowment is visible to her through her life experience, but is invisible to the researcher. However, any previous experience a woman has had with pregnancy may serve as an observable component of her health endowment. Since this sample contains only first births previous pregnancies must not have ended in a live birth. Miscarriages, the number of spontaneous terminations or stillbirths, serves as a proxy for the mother's health endowment.

However, not all miscarriages are alike. A miscarriage in the first trimester is different from a miscarriage in the second trimester which is in turn different from a miscarriage. The initial viability of a fetus is determined when the chromosomes from the sperm cell join with the chromosomes from the ovum. If either set of chromosomes contain badly damaged or are missing essential genes then the fetus will not be viable. This lack of viability will manifest itself early in the pregnancy and is not very representative of the mother's health endowment. A fetus which survives into the mid or late term of the pregnancy can be assumed to be genetically viable. The miscarriage of a viable fetus is more representative of the mother's health endowment. To account for this qualitative difference, miscarriages have two variables; early term miscarriage, (less than 14 weeks), and late term miscarriage, (14 weeks or more).

A pregnancy of twins or triplets may have physiological complications which may prompt the mother to seek prenatal care earlier than she would if the pregnancy was a singleton.

Women who smoke tobacco, drink alcohol, or use drugs of any kind during pregnancy are more likely than abstaining mothers to experience pregnancy-related problems which lead them to seek prenatal care earlier than otherwise. Alcohol drinking, tobacco smoking, and drug taking are endogenous in that the knowledge of being pregnant may cause the mother to modify her behavior regarding these substances. It is hard to justify the use of endogenous variables to predict another endogenous variable, so these substance use variables are excluded from the prenatal care equation. Drug deaths in a health area are correlated with narcotics use in that health area and may be correlated with narcotics use of the mother. This suggests that drug deaths can proxy for narcotics use in the prenatal care demand equation. However, the data are not rich enough to obtain a predicted drug use variable because drug deaths is measured by health district, of which there are 30 in NYC, not by health area, of which there are 355. Consequently, there is insufficient variation in drug deaths to serve as a regressor for drug use.

Birthweight production, b, is measured as the infant's weight in grams at birth. Its regressors, the x, m, n, and n/m variables, are the inputs to the production function such as the mother's behaviors, and the function's parameters such as the sex of the baby. Observable behaviors are the amount of prenatal care demanded and substance use. Other important but unobserved behaviors are the mother's nutrition, her degree of carefulness, and her avoidance of stress.

It is assumed that the mother's education significantly affects non-market production which includes the production of good nutrition and a stress-free environment. Father's education is excluded from the birthweight production equation because traditionally men's education has been, and still is, very market oriented. Increases in a man's education will not significantly increase his pregnancy-relevant non-market productivity.

While father's education is not an input, the presence of a competent relationship partner, usually a husband, is an input. The marital status of the mother and a variable indicating whether the father's education is missing from the birth certificate are included in the production function in order to measure the strength of the mother's relationship with the father.

The missing father's education variable should capture the loss of the benefit a woman may derive from being in a stable relationship with a man even though she may not be married to him. The reasoning is if a woman forgets or never knew the father's educational attainment, she was not in a very close relationship with him and did not benefit from his potential input into the relationship. It is assumed that father's education would be missing only for single mothers.

The mother's marital status variable will not capture any input provided by the mother's parents if she spends her pregnancy with them, nor the input of a same sex partner. These two cases can be problematic for NYC. A third of births to Blacks and Hispanics are to teenage mothers. Teenage mothers are much less likely to be married or live independently of their parents than are adult mothers. NYC is one of the cities in the U.S. where homosexual households are becoming increasingly common.

The obstetrician can also affect the weight of the baby. Obstetrical care provided by a private physician can differ from that provided in a public clinic. Whether the delivery is performed by a private physician is included in the birthweight function.

Parameters of the birthweight production function, as opposed to inputs controlled by the mother, are the sex of the infant, the mother's health endowment as proxied by the number of miscarriages, and the plurality of the birth.

The mother's age is excluded from the production function even though it is a potentially important factor in birthweight determination. Mother's age becomes important if she is very young or very old. This sample excludes births to mothers under 15 and over 40 years of age. Within these years age risk is presumed to be uniform.

Year dummies are included in both equations to capture secular changes during the decade such as the development of new medical technology or the development and use of illegal drugs such as crack cocaine. Mother's place of birth enters as a dichotomous variable, the two categories being born in or outside the continental U.S.. This is to capture any differences between immigrant and native mothers, and is particularly important for New York City because it has a large immigrant population relative to most other cities in the U.S.. Dummy variables indicating missing values for the education, mother's place of birth, and the financial coverage variables are also included.

The variables which proxies the fixed effects are mother's cohort or year of birth. Cohort enters non-linearly as cohort and cohort squared.

Section IV Data and Estimation

The data on the births come from the birth certificates for the years 1980 through 1990, maintained by the NYC Vital Statistics Bureau. The birth certificate data is augmented by data from the 1980 and 1990 censuses, which have been aggregated from the census tract level to the health area level. This data include race and ethnicity specific poverty rates, and female population between 15 and 44 years of age. Data on the number of family planning clinics and prenatal care clinics in each health area comes from the NYC Dept. of Health surveys of 1983 and 1991. The NYS Data Book provided unemployment rates by borough. Data on the number of drug deaths per 100,000 of population in each health district comes from the NYC Vital Statistics Handbook for the years 1984, (the start of the drug deaths record), through 1989.

The poverty rates and number of clinics for the years between 1980 and 1990 were calculated by linear interpolation. The number of drug deaths for 1983 was calculated by linear extrapolation.

The total population of NYC is very large and a proportionately large number of babies are born every year. To save on computer time, a random sample of births was analyzed. Approximately every second eligible observations was selected for the sample.

Some observations had data values which were clearly erroneous due to perfect or near perfect impossibility. There were gestation values of 1 and 2 days, and one of 655 days. Some infants reported weighed 5 grams at birth. To prevent inclusion of such errors, gestation was limited to between 28 and 325 days, and birthweights below 200 grams were rejected. Nine observation were excluded due to these restrictions.

There were several births where the mother made her first prenatal care visit in the first week after conception. An even larger number of mothers waited until only the second week after conception to see an obstetrician. If the act which lead to conception is was uniformly distributed over the mothers cycle, then, at least half of those delaying two weeks or less did not miss a menstrual period before seeing an obstetrician. These mothers did not make this first visit because they knew they were pregnant but because they suspected they were pregnant. These very early visits are primarily to confirm a pregnancy. Whether such visits constitute legitimate prenatal care visits depends on the content of such visits. If the physician gives advice on the potential pregnancy then the visits are legitimate. If the physician says that it is too early for anything to be done and instructs the mother to come back after a menstrual period has been missed, then it is not a legitimate visit. Since the content of prenatal care visits is not controlled for, there is no way to distinguish the two cases. In either case, by making such a visit the mother is separating herself from those who delay much longer. This in itself contains valuable information and justifies treating all very early visits as legitimate.

Each birthweight equation, (3) and (5), is estimated by the two stage least squares method, (2SLS). There is simultaneity because both the mother's behaviors, including when she makes her first prenatal care visit, and the baby's weight are affected by the mother's health endowment, the fixed effect. Including observed, rather than predicted, prenatal care demand in the birthweight equation will yield an inconsistent coefficient on prenatal care demand because of correlation with the disturbance term. The point of this paper is to reduce the inconsistency by taking as much of the mother's health endowment as possible out of the disturbance term. As noted in Section II, the fixed effects variables only removes that part of the endowment which changes between cohorts. The differences among mothers within a cohort remain.

The birthweight equation is identified by excluding the method of financing, father's education, mother's age, and the health area variables, which are included in the prenatal care equations.

In these models, the mother's marital status and her education are being treated as exogenous. It has been argued that they are endogenous in that pregnant teens are more likely to marry and/or drop out of high school than are non-pregnant teens. Joyce (1988, 1990) states that, for adolescents in particular, the decision to give birth may be made simultaneously with the decision to complete school, to apply for Medicaid, or to marry.

The argument of endogeneity for this dissertation is rejected for three reasons. The first, anecdotal, is that teenage girls who have a promising future do not throw it away by having a child while an adolescent. The promising future can be either further education and a fulfilling career or marriage to man with desirable socio-economic characteristics. Teenage girls with a promising future who are sexually active use contraceptives. If they get pregnant, they abort. Where contraceptives and abortions are not available, teenage girls with promising futures are not sexually active.

The second reason is based on empirical evidence. Table 1 in Appendix B shows that 69% of Black mothers and 52% of Hispanic mothers are single at the time of birth. Only 12% of White mothers are single at the time of birth. If pregnant teens tended to marry before the child's birth, then these figures would be far, far lower. Further, the problem of endogenous marriage for teenage single mothers is not as large as it may seem. Births to teenage mothers make up only 10% of all White births, compared with 37% and 36% for Black and Hispanic births respectively. Clearly, endogenous marriage is not a problem for Blacks and Hispanics. Any problem with the endogeneity of marriage will only be for Whites. The low proportion of teenage White mothers strongly limits the effect of any endogeneity and justifies treating marriage as exogenous.

The third reason, also based on empirical evidence, is that teen pregnancy does not cause low education, nor vice versa. Rather, factors present, or absent, in a girl's childhood cause both teen pregnancy and low education. In studying the relationship between education and smoking, Fuchs found that additional years of schooling after high school had no effect on smoking behavior, (Fuchs, 1986). He reasons that "(t)he relative differences in the probability of smoking that are observed at age 24 between persons with differing years of schooling, are already present at age 17, before the schooling is obtained." (Fuchs, 1986, p. 249). Analogously, the relative differences in the probability of bearing a child before age 21, observed at age 18 between women with differing years of education, (high school graduate or not), may already be present at age 11 or 12, before a high school education is obtained. This hypothesis can be specifically tested by using grade average as well as years of education as regressors. The theory being that girls who perform well in the early years of high school are more likely to complete high school and remain childless during adolescence than girls who perform poorly in the early years of high school.

This hypothesis implies that there is at least one omitted or unobserved factor which is influencing academic achievement, the likelihood of becoming pregnant, and/or the likelihood of legitimizing the birth. Research into teenage childbearing has identified some such factors.

The degree of religiosity has been associated with delayed childbearing, (Devaney and Hubley, 1981; Jessor and Jessor, 1975). Those who attend a religious institution regularly are less sexually active than those for whom religion is not important. Religious affiliation does not appear to be important. The degree of emotional independence from one's parents is another factor. Emotional distance of girls from their parents may cause the girls to seek closeness with their peers. Some studies have indicated that early sexual activity is associated with poor communication with or little support from their parents, (Simon et al, 1972; Jessor and Jessor, 1975). The content and context of the communication was not controlled for. The results of such studies may not be generalizable. There is evidence that daughters of mothers who were teenagers at first birth, are more likely to themselves be teenagers at first birth, (Newcomer and Udry, 1983; Presser, 1976b). Physical development has also been as an important factor influencing sexual activity. Among girls, the early onset of menarche was strongly associated with the early initiation of sexual activity, (Billy and Udry, 1983; Udry, 1979). Teenagers whose parents are well educated or place a high value on education, tend to be more goal oriented and themselves place higher value on education, (Conger, 1973; Chilman, 1980b). Teenagers with such an orientation may delay initiation of sexual activity and complete high school to a greater extent than other teenagers.

What this research implies is that the likelihood of a teenager becoming pregnant and dropping out of school depends on that girl's personal and familial characteristics. For most children these characteristics are relatively constant and present throughout their childhood. This directly contrasts with the sequence of decisions displayed in Risking the Future. It shows that the decision to carry the pregnancy to term and to marry, and by implication to complete high school, is made after the girl has conceived. It is assumed that teenagers have a *tabla rasa* which is written upon only after the pregnancy is discovered. However, a sixteen or seventeen year old may already have had ten years of religious education before being presented with a sexual situation requiring decisions, the likes of which are described in Risking the Future. Those who support universal and uniform endogeneity of marriage and education for teenagers are ignoring the fact that the time when a decision is made and the time when it is implemented need not be the same. The very point of much education and training, particularly sports and military trainings, is precisely to separate the two in order that a decision's implementation may be faster. Teenagers make their decisions about sex, education, and marriage, at the time they are taught about those subjects, given that they accept the legitimacy of the content and the legitimacy of the teacher. They implement those decisions possibly many years later when faced with sexual situations. The author's point is that endogeneity of marriage and education is of degree, depending on the extent to which the above factors are present or absent in the sample. Ideally, the degree of endogeneity would be determined empirically for each sample. This is difficult because factors, such as intra-familial communication, is very hard to observe and quantify.

The factors mentioned above were discussed in the context of correlation to education and marriage. If these factors, which are excluded from the regression equations, are correlated with birthweight production or, and more likely, with prenatal care demand then the coefficients on education and marriage will be biased, regardless of the age of the mother. For example, if religiosity is positively correlated with both prenatal care demand and education then the coefficients on the education variables, discussed below, will be biased away from zero.

The education variables are dichotomous with five categories; college graduate, some college, high school graduate (the omitted category), not a high school graduate, and not an elementary school graduate.

In the prenatal care initiation delay equation, the less than high school education should have positive coefficients and the more than high school education negative coefficients. It is expected that having more education should result in less delay due to both having more monetary income and higher non-market productivity. In the prenatal care visits equation, the less than high school education should have negative coefficients and the more than high school education positive coefficients. It is expected that having more education should result in more visits for the same reasons as for less delay.

The financial coverage of the birth is dichotomous with three categories; out-of-pocket payment, Medicaid payment, and third party insurance payment, (the omitted category). Third party health insurance is most often provided through employment. Payment by other means indicates a lack of employment which provides health benefits, or part-time work or non-salaried, non-unionized work. These types of work are among the lowest paying in the American economy. Third party health insurance also lowers the out-of-pocket cost of prenatal care to the beneficiaries. The coefficients on self-payment and Medicaid payment should be positive in the delay equation and negative in the visits since they are associated with lower earnings and a higher price of prenatal care.

Poverty and unemployment rates measure income and income opportunities. Lower poverty and unemployment rates represent a higher monetary income level and therefore higher demand for prenatal care. This implies that their coefficients are positive in the delay equation and negative in the visits equation. Lower poverty and unemployment rates also represent higher opportunity costs of time. This raises the full cost of prenatal care, lowering the quantity demanded. This implies that their coefficients are negative in the delay equation and positive in the visits equation. It cannot be determined a priori whether the increase in demand due to lower poverty and unemployment rates is greater than or less than the decrease in quantity demanded due to an increase in opportunity costs.

Drug deaths can be a proxy for narcotics use, which should have a positive impact on prenatal care demand because of the pregnancy complications narcotics use causes. This implies a negative coefficient in the delay equation and positive one in the visits equation. However, drug deaths can also measure income to the extent that narcotics use in a health district and income opportunities in that health district are correlated. If this correlation is negative then the drug deaths coefficient would be positive in the delay equation and negative in the visits equation. It cannot be determined a priori which effect is stronger.

The coefficient on prenatal care clinics is expected to be negative in the delay equation and positive in the visits equation. The greater the availability of prenatal care the greater its quantity demanded.

The coefficient on family planning clinics is also expected to be negative in the delay equation and positive in the visits equation. The greater the availability of family planning services the lower the cost of contraception. The increased use of contraceptives leads to a decrease in the demand for quantity of children and an increase in the demand for quality of children. Increasing the quality of children starts with increasing the amount of prenatal care they receive.

The coefficient on plurality should be negative in the delay equation and positive in the visits equation. Being pregnant with twins or triplets leads to greater prenatal care use.

Both the early and late miscarriages variables should have negative coefficients in the delay equation and positive in the visits equation since a mother who has had a previous bad experience with pregnancy can be expected to initiate prenatal care earlier for the next pregnancy and make more frequent visits to her obstetrician.

In this paper mother's age is dichotomous, adult versus adolescent. A mother is an adult if she has her first child at age 21 or older. It is expected that adults initiate prenatal care earlier and make more visits than adolescents.

Single mothers are expected to initiate prenatal care later and make fewer visits than married mothers because they must contribute more to the management of their households than married mothers. A single mother's time is more valuable than a married mother's time. The higher value of time raises the full cost of prenatal care lowering the quantity demanded. Married mothers also have available their husband's earnings with which to purchase prenatal care. This non-labor income of married mothers increases their demand for prenatal care relative to otherwise identical single mothers.

In the birthweight production equation, the more than high school education variables should have positive coefficients and the less than high school education variables should have negative coefficients. More highly educated mothers are assumed to be more productive in the home, ie.

produce better nutrition and less stress, than less highly educated mothers.

The substance use variables should all have negative coefficients.

The late miscarriages variable should have a negative coefficient since it indicates a smaller health endowment. Women with smaller health endowments produce less healthy, (lighter), babies. The early miscarriages coefficient should be insignificant, or at least have a smaller magnitude than the late miscarriages coefficient, if in fact the early miscarriages variable captures mostly genetic viability, or at least less of the mother's health endowment than the late miscarriages variable.

Single mothers are expected to bear lighter babies than married mothers, due to the burdens they must bear which married mothers have their husbands bear.

Twins and triplets will be lighter than singletons.

The obstetrician's input variable is expected to have a positive coefficient. Mothers receiving private obstetrical care bear heavier babies than other mothers.

The coefficients of most interest, those on predicted prenatal care demand, no longer have strong economic significance due to the inclusion of the interaction term. It is the marginal birthweight product of prenatal care delay which is expected to be negative, not its coefficient. The marginal birthweight product of prenatal care visits is expected to be positive. However, a negative coefficient on delay would greatly contribute to a negative marginal product for prenatal care initiation delay, and a positive coefficients on visits would greatly contribute to a positive marginal product for prenatal care visits. The interpretation of the prenatal care coefficients as direct effects on birthweight leads to the prediction of a negative coefficient on delay and a positive coefficient on visits.

Due to the 2SLS estimation, the interpretation of the prenatal care coefficients needs to done in conjunction with the results of exogeneity tests. Two tests of the exogeneity of were performed, a Wu test of joint exogeneity and a Wu-Hausman test of individual exogeneity.

In the Wu test, birthweight was regressed on predicted prenatal care and the other variables, but predicted prenatal care was entered as observed prenatal care minus the errors from the first-stage regression. These errors contain the influence of the unobservable variables, such as the mother's health endowment. Correlation with these errors indicates endogeneity on the part of the prenatal care variables. Birthweight should be correlated with this errors variable in the non-fixed effect equation and uncorrelated in the fixed effect equation if in fact the fixed effect variables are capturing the mother's health endowment. The calculated statistic follows an F distribution. Its numerator degrees of freedom are the number of prenatal care variables being tested.

In the Wu-Hausman test, the null hypothesis is that prenatal care is independent of the disturbance term, the alternative hypothesis is the they are not independent. Birthweight is regressed on one prenatal care variable, the one whose exogeneity is being tested, using observed values, and the remaining prenatal care variables using predicted values. This gives an OLS coefficient. This OLS coefficient is compared to the coefficient on the same prenatal care variable using predicted values, the 2SLS coefficient. Under the null hypothesis, the two coefficients are consistent and will have similar values, though the OLS coefficient would have a smaller variance than the 2SLS coefficient. Under the alternative hypothesis, the OLS coefficient is inconsistent while the 2SLS coefficient is consistent. They will have dissimilar values. The OLS coefficient will still have a smaller variance than the 2SLS coefficient. The comparison involves calculating the squared difference between the values of the two coefficients, the difference between the variances of the two coefficients, and then the quotient of the two differences, variance difference in the denominator. The calculated statistic, the quotient, is larger the greater the correlation between the prenatal care variables and the disturbance term. It follows a Chi-squared distribution, with one degree of freedom.

Section V RESULTS

Almost all of the coefficients in the fixed effect prenatal care delay equation, which are significant at 5%, (t value 1.645 for a one-tailed test), have the expected sign. The exceptions are mother's education missing, family planning clinics, and early miscarriages.

Prenatal care quality is not controlled for in this dissertation and therefore it manifests itself through the disturbance term. Hansell's, (1991), results indicated that maternal education and marital status are correlated with prenatal care quality and therefore, in this dissertation, with the disturbance term. The mother's education coefficients will be biased away from zero and marital status coefficients will be biased upwards in the birthweight production equations. Furthermore, racial differences in mean birthweight, deservedly attributed to differences in prenatal care quality, may be erroneously attributed to differences in levels of education, the proportion of married mothers, or directly to race.

It was presumed that mothers who did not answer all the birth certificate questions would have worse birth outcomes and demand less prenatal care. For example, mothers who did not know or did not record the father's education on the birth certificate delayed significantly longer than mothers whose male mates have finished only high school. This was true for Whites, Blacks, and Hispanics. Mothers whose education was not recorded on the birth certificate delayed significantly less than mothers who finished only high school in the White and Hispanic regressions. The coefficient was significantly positive, as expected, only in the Black regression.

The coefficient on family planning clinics was significantly positive in the White, Black, and Hispanic regressions. This variable is supposed to measure the availability of abortion services. However, an important aspect of this variable, the location of a clinic may significantly distort the measurement of abortion services. In many cities, and especially in New York, location is highly correlated with income. Family planning clinics tend to located in low income areas. In higher income areas, women can obtain family planning information from their family physicians. A higher number of family planning clinics in a health area is indicative of low average income. Lower income adequately explains lower prenatal care demand as measured by longer delay.

The coefficient on early miscarriages is significantly positive in the White regression, insignificant in the Black regression, and significantly negative in the Hispanic regression. An insignificant coefficient was expected, but a negative one is entirely reasonable. An early miscarriage may cause a woman to perceive a lower health endowment and compensate with earlier prenatal care initiation. A positive coefficient has no logical explanation expect perhaps the fear of bad news.

The unemployment rate coefficient is significantly negative in the White and Hispanic regressions, and insignificant in the Black regression. This implies that the opportunity cost of time is dominates income with regards to prenatal care initiation. In other words, mothers are more sensitive to the time price of prenatal care than to the money price of prenatal care with regards to the first prenatal care visit. The poverty rate coefficient is significantly positive in all three regressions. This implies that income dominates the opportunity cost of time. Apparently contradicting the result for the unemployment variable. The size of the coefficient, the largest is 0.47 for Hispanics, appears small. The 24 percentage point difference between the mean White and Hispanic poverty rates accounts for only 11 days of additional delay. (The mean delay for Hispanics is 49 days longer than that of Whites.) This can be due to measurement error. The poverty rates are taken at only two points in time, 1980 and 1990. The poverty rates for the intervening years are calculated by linear interpolation. These interpolated values are poor substitutes for the actual poverty rates. Taken together, these two coefficients suggest that the working poor are especially hard pressed when trying to initiate prenatal care.

The drug deaths coefficient is significantly positive in all three regressions. This implies that this variable proxies income opportunities better that it does maternal drug use.

The coefficient on prenatal care clinics is significantly negative, as expected, in all three regressions. However, it appears small. An additional prenatal care clinic, (per 10,000 women between ages 15 and 44), in the mother's health area of residence will cause her to seek prenatal care at most two days earlier. This can be due to measurement error. These two variables are doubly interpolated. The physical number of clinics is interpolated between 1983 and 1991, and the number of women aged between 15 and 44 years is interpolated between the census dates, 1980 and 1990.

The payment variables, while significantly positive, as expected, in all three regressions, contain an anomaly. In the Black and Hispanic regressions the self-pay coefficient is larger than the Medicaid coefficient. This is to be expected because Medicaid recipients face a lower price of prenatal care than do self payers. In the White regressions, however, the self-pay coefficient is smaller than the Medicaid coefficient. This implies that, ceteris paribus, medicaid recipients demand less prenatal care than self payers even though they face a lower price than do self payers. The only explanation is that all other things are not equal. For Blacks, the self-pay coefficient becomes smaller than the Medicaid coefficient in the non-fixed effect equation. It seems that poor Whites in particular delay the first prenatal care visit for reasons unrelated to being poor.

The coefficient on the foreign born variable is significantly positive, as expected, in all three regressions. The coefficient on the variable indicating a missing value for the foreign born variable is insignificant in all three regressions. This result was unexpected. It implies that those mothers who were not asked about their place of birth or wished to hide it, (undocumented aliens for example), do not delay prenatal care significantly longer than mothers whose immigration status is known or established.

In the non-fixed effect prenatal care delay equation, none of the coefficients is appreciably different from their values in the fixed effect equation except for the coefficient on the teenage mother variable. While still significantly positive, its value doubles in the Black and Hispanic regressions, and increases by one half in the White regression. This indicates that the fixed effect variables, cohort and cohort squared, are strongly correlated only to the mother's age. In the White regression only, mother's and father's college completed variable and the late miscarriages variable become significant in the non-fixed effect equation.

Almost all of the coefficients in the fixed effect prenatal care visits equation, which are significant at 5%, (t value 1.645 for a one-tailed test), have the expected sign. The exceptions are the mother's education missing variable and the family planning clinics variable.

The coefficient on family planning clinics was significantly negative in the Black and Hispanic regressions, and insignificant in the White regression. A positive coefficient was expected. As explained above, the correlation between clinics and income is contributing to the predicted decrease in the number of prenatal care visits as the number of family planning clinics in a health area increases.

The coefficient on the mother's education missing variable is significantly negative, as expected, only in the Black regression. It is significantly positive in the White and Hispanic regressions. In both equations White or Hispanic mothers whose education values are missing from their children's birth certificates demand more care than mothers whose education are not missing. Mother's education is missing in 4.1% of White births, 2.2% of Black births, and 2.1% of Hispanic births. Among those who not received any prenatal care, the proportions are 13.1% for Whites, 4.4% for Blacks, and 2.6% for Hispanics. This strongly suggests that missing mother's education is negatively correlated to the amount of prenatal care demanded. The unexpected signs on the White and Hispanic coefficient suggest that there is additional correlation with other variables associated with more prenatal care.

The coefficients on early and late miscarriages are significantly positive, as expected, in all three regressions. Furthermore, the coefficient on late miscarriages is larger in magnitude than the early miscarriages coefficient. Apparently for White mothers, once the bad news is over with mothers with early miscarriages visit more frequently.

The unemployment rate coefficient is significantly negative in the White and Black regressions, as expected, but significantly positive in the Hispanic regression. The result on unemployment is puzzling. Hispanic women faced with higher likelihood of unemployment demand more prenatal care, indicating that the opportunity cost of time allocated to prenatal care dominates the money cost of that care. Black women faced with higher likelihood of unemployment demand less prenatal care, indicating that the money cost of care dominates the time cost. White women faced with higher likelihood of unemployment initiate prenatal care earlier but obtain fewer visits, seemingly contradictory behaviors.

The anomaly in payment variables was again present. The medicaid coefficient was more negative than the self-pay coefficient in all three regressions. However, both coefficients were insignificant in the Hispanic regression and the self-pay coefficient was insignificant in the White regression. Whether it be stigma, embarrassment, or the refusal of physicians to accept Medicaid patients, the Medicaid program, especially for Whites, is not increasing prenatal care utilization as it could or should.

The coefficient on the foreign born variable is significantly negative, as expected, in all three regressions.

The coefficient on the foreign born value missing variable is significantly negative only in the Black regression. It is insignificant in the White and Hispanic regressions. As in the delay equation, those women whose place of birth value is missing do not demand significantly less prenatal care than other mothers.

In the non-fixed effect prenatal care visits equation, none of the coefficients is appreciably different from their values in the fixed effect equation except, again, for the coefficient on the teenage mother variable. It was insignificantly negative in all three fixed effect regressions. It became significantly negative in all three non-fixed effect regressions.

The birthweight equations have several unexpected results. Starting with mother's education, none of the coefficients on the mother's education variables are significant in the Hispanic regression. Two, the coefficients on the college incomplete and college completed variables, are significant in the White regression but the college completed coefficient has an unexpected negative sign. In the Black regression, two variables, high school incomplete and college incomplete, have significant coefficients with the expected signs. The mother's education missing variable has an insignificant coefficient in all three regressions. These results taken together strongly suggest that mother's education has little direct effect on birthweight. Its effect is almost entirely indirect through the demand for prenatal care.

The father's education missing variable is significantly negative, as expected, in the Black and Hispanic regressions, and insignificant in the White regression. (The magnitude of the coefficient in the Black regression is four times that in the White regression and thrice the Hispanic coefficient. This suggests that family structure and family formation may be of particular importance to the New York Black community.)[6] It also indicates that a close relationship between the mother and father, compared to a casual one, benefits the baby. The mechanism may be that a close relationship in and of itself is beneficial, or that a selection phenomenon is occurring. Women who are able to develop and maintain a close relationship with a man may bear heavier babies than women who are not, or women who are able to attract and hold higher quality men may also bear heavier babies than women who are not.

The coefficients of the substance use variables, other than alcohol use, are all significantly negative, as expected, in all three regressions. The alcohol use coefficient is unexpectedly positive in the White and Black regressions, (insignificantly negative in the Hispanic regression). It is significant only in the White regression. These results

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[6] The father's education value is missing in 9.7% of White births, 43.1% of Black births, and 22.8% of Hispanic births.

strongly suggest that moderate alcohol use does not significantly retard fetal growth. These results coincide with those of Olsen, Pereira, Olsen, (1991,) who found that only heavy drinking, (more than 120 grams per week), significantly reduced birthweight. The results of the White regression suggest that alcohol has an as beneficial effect on birthweight as narcotics has maleficial. There is no clear explanation for this. However, alcohol came be consumed in many different forms; beer, wine, or distilled spirits for example. The marketing of alcohol indicates that the form of alcohol consumption is correlated with socio-economic background. Since the form of alcohol consumption is not controlled for, an aspect of socio-economic status is also not controlled for and is therefore being captured by the alcohol use variable. The Whites of New York may consume alcohol in a form which is positively correlated with high socio-economic status and cause the alcohol use variable to reflect effect of that status on birthweight.

The early miscarriages coefficient is negative in all three regressions, significantly so in the Black and Hispanic regressions, though not in the White regression. The late miscarriages coefficient is significantly negative, and greater in absolute value than the early miscarriages coefficient, in all three regressions. This indicates that all miscarriages, regardless of timing, reflect a somewhat poorer maternal health endowment. The late miscarriages coefficient in the Black and Hispanic regressions is three times larger than the White coefficient. The early miscarriages coefficient in the Black and Hispanic regressions is four times larger than the White coefficient. This suggests that the absolute or percentage decline in health endowment of White women due to miscarriages is less than that for Black or Hispanic women. It may also suggest that White women recover faster or more completely from miscarriages than do Black or Hispanic women.[7]

The coefficient on the single mother variable was significantly negative, as expected, in all three regressions. This suggest that the state of being unmarried does have some direct effect on birthweight in addition to the indirect effect manifested through prenatal care demand.

The coefficient on the foreign born variable is significantly positive in the Black and Hispanic regressions. The coefficient is insignificantly negative in the White regression. This is an unexpected result and is especially vexing given that foreign born mothers demand significantly less prenatal care than do American born mothers. A possible explanation is that the decline of sexism in the United States relative to the rest of the world gives American women a value set which put less emphasis on "behaving maternally". A more

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[7] The combined miscarriage rate, (number of miscarriages per 100 live births, not number of women who had miscarriages), was 11.0 for Whites, 10.6 for Blacks, and 8.3 for Hispanics. This suggests that Hispanic women have higher health endowments than White or Black women.

likely explanation lies in the fact that immigrants are a self-selected group. The labor economics literature describes an overtaking of native workers' earnings by immigrant workers' earnings after a 10 to 15 year period of adaptation, (Borjas, 1987). The women who emigrate to the U.S. and bear children may be drawn from sufficiently high in the upper tail of the country's health endowment distribution so as to still have an above average health endowment in the U.S. distribution of health endowments.

The foreign born missing variable is significantly negative, as expected, in the White and Black regressions. It is insignificant in the Hispanic regression. If mothers whose place of birth was missing were predominantly undocumented aliens, then the question arises as to why Hispanic undocumented aliens do so much better than White or Black undocumented aliens.*

The coefficients of most interest are those on prenatal care demand. In the fixed effect equations, the prenatal care delay coefficient is significantly negative, as expected, in all three regressions. The prenatal care visits coefficient is significantly positive, as expected, in the White and Hispanic regressions. It is insignificantly positive in the Black regression. The prenatal care interaction coefficient is negative in all three regressions, though significant in

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* The place of birth value is missing in 43 White births, 63 Black births, and 28 Hispanic births.

none.[9] The coefficients on delay and visits show that obtaining more prenatal care improves birth outcomes. The negative coefficient on the interaction variable suggests that timing of the first prenatal care visit and the number of prenatal care visits made during the pregnancy are substitutes in the production of birthweight.

The equation which omits the interaction variable, (ie. restricts the coefficient to zero), allows for comparisons. The magnitudes of delay and visits coefficients decreased in all three regressions. The significance of the coefficients did not change. The reductions in the coefficients in the White and Black regressions are additional evidence that prenatal care delay and prenatal care visits are substitutes in the production of birthweight. The prenatal care coefficients in the interaction included equation give the direct marginal impact that delay and visits have on birthweight. The prenatal care coefficients in the interaction excluded equation give the total marginal impact that delay and visits have on birthweight and are the marginal birthweight products of prenatal care. The difference between the direct and total marginal impacts is the indirect marginal impact on birthweight due to the relationship between delay and visits. The relationship counteracts the direct marginal

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[9] The predicted prenatal care variables are highly correlated with each other. $|r| > .90$ is almost all combinations and $|r| > .80$ in the remaining ones. This will result in inflated standard errors and corresponding deflated t-scores.

impact on birthweight, reducing the potential effectiveness of prenatal care. This is also evidenced by the difference between the interaction included prenatal care coefficients and their calculated marginal birthweight products.

The results of the birthweight equations strongly suggest that a woman's behavior, such as her decision as how much prenatal care to consume or her use of substances, influence birthweight much more than her personal characteristics, such as her education, or marital status.

The prenatal care coefficients in the non-fixed effect equations did not seem to change appreciably or in a consistent manner from the fixed effect coefficients. For the White regression, they and their t-score decreased slightly in absolute value. For the Black regression, the delay coefficients and their t-scores decreased in absolute value in the interaction excluded equations but do not change in the interaction included equations. The visits coefficients and their t-scores increase in absolute value in all four equations. In the Hispanic regression, the prenatal care coefficients and their t-scores decreased in magnitude, except for the delay coefficient in the interaction excluded equations. It and its t-score increased in magnitude.

Joint hypotheses tests were performed on the fixed effects variables. All F values are significant at 1% indicating that the cohort variables are adding significant explanatory power to the regressions and therefore belong in them. The size of the prenatal care F values compared to the birthweight F values is illuminating. For Whites, the prenatal care delay F value is six times and the prenatal care visits F value twelve times the birthweight F value, (in the all variables included equation). For Blacks, the prenatal care delay F value is seven times and the prenatal care visits F value nine times the birthweight F value. For Hispanics, the prenatal care delay F value and the prenatal care visits F value are each five times the birthweight F value. The fixed effect variables are adding far more explanatory power to the prenatal care equations than to the birthweight equation. The low correlation with the other regressors confirms that they are not simply shifting explanatory power among the regressors, but that, especially for prenatal care, they are bringing in information that the other regressors are not capturing.

The large difference in the F values for prenatal care and birthweight implies that prenatal care is much more strongly correlated with the fixed effect than is birthweight. There is a plausible explanation for this. The fixed effect is proxied by cohort. There has been tremendous inter-cohort change during the last 40 years regarding many aspects of a woman's life but especially her income earning opportunities. More and better opportunities to earn money raise a woman's cost of time. The coefficients on the individual cohort variables indicate that prenatal care delay is increasing as the cohort becomes younger or more recent. If the current generation of women has more income earning opportunities, and therefore higher time costs, than previous generations then longer delay should be observed.

The results of the Wu test, which are presented with the coefficients in Appendix C, are that the null hypothesis of exogeneity, for the prenatal care variables as a group, is rejected in all three regressions at a 1% level of significance. The calculated F statistic for Hispanics greatly exceeds those of the White and Black regressions. This is interpreted as indicating that the strength of endogeneity is much larger for Hispanics than it is for Whites and Blacks. The results of the Wu-Hausman tests, which are presented in Appendix F, are that the null hypothesis of exogeneity is not rejected for delay in all three regressions at a 1% level of significance. Exogeneity for delay is not rejected at a 5% level of significance for Whites or Blacks, and for Hispanics, is rejected at 5% only in the interaction included equation. The null hypothesis of exogeneity for visits is rejected in the White and Hispanic regressions at a 1% level of significance. For Blacks, at a 5% level of significance, exogeneity for visits is rejected only in the interaction included, non-fixed effect equation. The important result here is that endogeneity is much more pronounced for prenatal care visits than it is for prenatal care delay. Women with low health endowments compensate more by having more visits rather than starting care earlier. Except for Blacks, the non-fixed effect equations yield the same exogeneity results.

The R-squared's for prenatal care are surprisingly high, given that important variables are unavailable and therefore missing from the regression. The results indicate that a woman's value of time may significantly affect when she starts prenatal care. Every individual has competing demands on his or her time and allocates it in a utility maximizing manner. The prenatal care equations do not include any measure of the demands on a woman's time. Not even the most basic and universal demand on time, her employment, if any, is included. Clearly, a mother, a single mother in particular, with an inflexible job cannot schedule prenatal care visits with ease. She may delay the first visit or delay subsequent visits until other arrangements have been made or it is worthwhile confronting her supervisor. Including at least a dummy variable indicating employed or unemployed would raise the R-squared even higher. NYC has taken steps in this direction. In 1988 and later the birth certificates were expanded to include the mother's employment activity during her pregnancy.

The R-squared's for the birthweight production are low, also in part, because important variables are unavailable. The size of a baby is limited by the size of its mother. Larger women are physically able to bear larger babies. Smaller women are not. Some measure of the physical size of the mother needs to be included in the birthweight equations. The 1988 expansion of the birth certificates includes the mother's pre-pregnancy weight and a calculation of the weight gain during pregnancy. Ideally, the mother's height as well as her pre-pregnancy weight should be included as explanatory variables. There is wide variation in the sizes and shapes of individuals. Including some measure of this in the birthweight equation would go far in explaining additional variation in birth outcomes.

The marginal birthweight products are presented in Appendix E. The fixed effect values for prenatal care delay indicate that starting prenatal care earlier than the mean delay is not beneficial for Whites but is beneficial for Blacks and Hispanics. The non-fixed effect values indicate that starting prenatal care earlier is beneficial for everyone. The values for prenatal care visits indicate that more visits are beneficial to everyone, but most beneficial to Hispanics and least beneficial to Blacks.

The differences in the marginal product of visits, (the Hispanic marginal birthweight product is three times that of Blacks), may be partly explained by the quality of the visits. Previous research, (Hansell, 1991), has shown that women who are married or have higher levels of education receive better, ie. more complete, prenatal care than less educated or single women. The differing rates of high school completion and single motherhood help explain the White-Black difference in the marginal birthweight product of visits, but not the Black-Hispanic difference. While a higher proportion of Hispanic mothers are married at the time of birth than are Black mothers, a lower proportion complete high school. An investigation into the causes of the large difference in the marginal birthweight product of prenatal care visits between Blacks and Hispanics may uncover some more clues to the persistently high rates of low birthweight and infant mortality among Blacks. The low effectiveness of prenatal care visits for Blacks may be the most important finding of this dissertation. The White-Black differences in the mean number of visits and their effectiveness account for almost one half of the difference in mean birthweight.

The marginal birthweight product of delay is surprisingly low, considering how much importance it is given by health researchers. In the non-fixed effect equation, it is positive for Whites, even though the coefficient on delay, its direct marginal impact, is significantly negative. For Blacks and Hispanics, the marginal product is expectedly negative.

Not only prenatal care demand, but also any other behavior of the mother is potentially correlated to her health endowment. A mother with a low health endowment may make a concerted effort to reduce or eliminate smoking, or modify her diet during her pregnancy. The four substance use variables, narcotics use, alcohol use, smoking, and other drug use, which are included as independent variables in the birthweight equations, are potentially endogenous. Their coefficients may be biased. Ideally, these variables should be estimated in a first stage and their predicted values used in the birthweight equation, as is done with prenatal care. Rosenzweig and Schultz, (1983a), did regress infant mortality on maternal behaviors using the two-stage least squares method. The data for this dissertation is limited. Variables upon which maternal behaviors can be regressed are not available.

The birthweight equations were estimated excluding the substance use variables. The results for the White and Hispanic regressions are that no coefficients on any variables are substantially different from those in the equation including the substance use variables. In the Black regression, only the prenatal care coefficients have substantially changed values. In the interaction excluded equation, both the delay and visits coefficients and their t-scores increase in magnitude. The delay coefficient remains significant and the visits coefficient remains insignificant. In the interaction included equation, the coefficients of all the prenatal care variables and their t-scores increase in magnitude. The visits coefficient becomes significant and the interaction coefficient remains insignificant.

The results observed for Whites and Hispanics are to be expected. By construction, the predicted values of prenatal care are uncorrelated with the disturbance term in the birthweight equation, which includes the unobserved health endowment of the mother. When the substance use variables are excluded from the birthweight equation, their effect is embodied in the disturbance term. The predicted prenatal care variables, being uncorrelated with the birthweight disturbance term, should have unchanged coefficients. The result for Blacks is therefore surprising. Still, it clearly shows that predicted prenatal care is correlated with substance use.

There is a circumstance under which this result can be explained. It is that predicted prenatal care is correlated with a variable that observed prenatal care is not correlated with. Furthermore the sign of the correlation can be determined using econometric theory concerning omitted variable bias. The expected value of a coefficient when an important variable is omitted from the equation is

$$E(\hat{\beta}_1) = \beta_1 + \beta_2 * COV(X_1, X_2)$$

where: $\hat{\beta}_1$ is the prenatal care coefficient in the substance use excluded equation.

β_1 is the prenatal care coefficient in the substance use included equation.

β_2 is the substance use coefficient in the substance use included equation.

$COV(X_1, X_2)$ is the covariance between prenatal care and substance use.

Isolating the covariance term gives

$$COV(X_1, X_2) = (\hat{\beta}_1 - \beta_1)/\beta_2$$

Both $\hat{\beta}_1$ and β_1 are negative, but since $\hat{\beta}_1$ is larger in absolute value than β_1 the numerator of the right hand side is negative. The denominator of the right hand side, β_2, is also negative, making the right hand side, as a whole, positive. The covariance between prenatal care and substance use is therefore positive. Among Black women, the demand for prenatal care increases as narcotics use, tobacco use, or other drug use increases.[10]

Regarding the marginal birthweight products, the larger prenatal care coefficients for Blacks cause a modest increase in the values over the substance use included values.

Wu and Wu-Hausman exogeneity tests were performed on the substance excluded equations. The results for the Wu test were that the null hypothesis of exogeneity is rejected, at a 1% level of significance, in all three regressions, as was the case for the substance included equations. The F-scores in these equations were similar, in all three regressions, to those in the substance included equations for the non-fixed effect equations. For the fixed effect equations, the F-scores increased substantially in all three regressions. The

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[10] Smoking is the most frequently used substance. The proportion of births complicated by smoking is 3.0% for Whites, 5.6% for Blacks, and 3.8% for Hispanics.

results of the Wu-Hausman tests were the same as in the substance use included equations. Exogeneity for visits is rejected, at a 1% level of significance, in the White and Hispanic regressions. Exogeneity for delay is not rejected, at a 5% level of significance, in the White regression, and, for Hispanics, is rejected only in the interaction included equation. In the Black regression, exogeneity is rejected for visits at a 1% level of significance, in the interaction included, non-fixed effect equation, and at 5% in the interaction excluded, non-fixed effect equation. Exogeneity is not rejected for visits at a 5% level of significance in the fixed effect equations. Exogeneity is rejected for delay at 5% in the interaction included equation, but is not rejected at 5% in the interaction excluded equation.

The means, modes, and medians, for the birthweight, delay, and visits for each category are presented in Appendix G. Previous analysis shows that birthweight and prenatal care are not normally distributed, rather they are skewed. In light of this, the assumption of normal distribution implicit in the estimation method seems invalid. Estimation methods using a skewed probability distribution, such as the log-normal distribution, appear to be more appropriate.

The most compelling aspect of the tables in Appendix G is the mode. It is the same for almost all the categories for all three races/ethnicity groups. Comparing especially the two categories of received prenatal care and did not receive prenatal care, the mode for birthweight is lower in the did not receive prenatal care category only for Blacks. This finding implies that a White or Hispanic first time mother, of whom nothing is known except that she did not receive any prenatal care, will most likely bear an infant weighing the same as an otherwise identical women who receive prenatal care, and that infant's weight would most likely be normal for a first birth. It seems that prenatal care is not the dominant factor in birthweight production. This coincides with the findings of Geronimus and Korenman, (1992), who compared the socio-economic status of adult sisters who were both mothers, one giving first birth as a teenager and the other as an adult. They found that the correlation of adult socio-economic status between sisters was much stronger than the correlation of adult socio-economic status between women of similar observable characteristics, such as education, marital status, or age, who were not sisters. They concluded that family background characteristics, which includes genetic health endowment, are important in explaining the low socio-economic status of women who were teenage mothers, (Geronimus and Korenman, 1992). Some of the literature cited in section I, found strong correlations between socio-economic status and birthweight. This suggest that family characteristics, such as the education of the mother's parents, (not controlled for in this dissertation), may contribute substantially to the (grand)child's weight at birth, even if the mother has a different level of education than her parents.

Prenatal care demand and birthweight production equations were estimated for only those who received prenatal care. This was to explore the effect, if any, the no prenatal care group had on the effectiveness of prenatal care.

In the delay equation of the White regression, the coefficients have the same signs and significance decisions but slightly smaller magnitudes than those in the entire sample equation. In the visits equation, the coefficients have the same signs and significance decisions with the same or slightly smaller magnitudes as those in the entire sample equation. One notable exception is that the self-pay coefficient becomes both larger and significant. The coefficients in the birthweight equation, with the interaction and substance use variables included, are virtually identical to those in the entire sample equation. Two differences are that the narcotics coefficient is smaller in absolute value, and remains significant, and the delay coefficient and its t-score both become larger in absolute value. The coefficients in the remaining three equations, interaction and substance variables excluded, are not substantially different from their counterparts in the entire sample equations. In the prenatal care non-fixed effect equations, the coefficients were not substantially changed, except for the teenage mother coefficient which significantly increased. In the non-fixed effect birthweight equations the both prenatal care coefficients and their t-scores decrease significantly over their fixed effect counterparts in all four equations.

In the Hispanic regression, the delay coefficients and their t-scores are, for the most part, smaller than those in the entire sample equations. In particular, the coefficients on mother's education, (high school incomplete), family planning clinics and drug deaths become insignificant. Notable exceptions are the coefficients on the self-pay and Medicaid variables. They and their t-scores substantially increased. The same pattern emerges in the visits equation. The coefficients on family planning clinics and drug deaths again become insignificant. The coefficients on the self-pay and Medicaid variables and their t-scores again substantially increased in magnitude. The unemployment rate coefficient changed sign from significantly positive to significantly negative, the expected sign. This implies that Hispanic women who do not receive prenatal care tend to live in boroughs with low unemployment rates. The prenatal care delay and interaction coefficients and their t-scores in the two interaction included birthweight equations increased substantially over the same coefficients in the entire sample equations. In the interaction excluded equations, the delay coefficients and their t-scores decreased to the point of becoming insignificant. The visits coefficient and its t-score increased substantially in all four equations.

In the delay equation of the Black regression, most of the coefficients and their t-scores decrease in absolute value, as in the White and Hispanic regressions. The coefficients on the mother's and father's education is missing variables decrease to the point of becoming insignificant, as does the coefficient on drug deaths. However, the coefficient on the poverty rate decrease from significantly positive to significantly negative. This implies that Black women who do not receive prenatal care tend to live in areas with higher poverty rates.

In the visits equation, some coefficients decrease in absolute value, but some others increase. Most of the education coefficients decreased. The coefficients on self-pay and family planning clinics became insignificant. But the mother's education is missing coefficient changed from significantly negative, the expected sign, to significantly positive. This would suggest, if it did not directly contradict the data, that few women who did not receive prenatal care omitted their education from the birth certificate. Whatever was making the White and Hispanic coefficients imply more prenatal care to mothers who omit their education, in the complete sample equations, is now also in operation for Blacks in the prenatal care only sample. The coefficients and their respective t-scores on the teenage mother and foreign born variables both nearly doubled in absolute value. The teenage mother coefficient becomes significant.

In the birthweight equations, excluding prenatal care, none of the coefficients are substantially changed from the entire sample coefficients, though the narcotics and early miscarriages coefficients decreased. The prenatal care coefficients are substantially different from those of the entire sample; their signs are reversed in the two interaction included equations. However, the visits coefficient is not significant in any equation. The delay coefficient is significant in only one, a non-fixed effect, equation. The interaction coefficient is significant in both the equations it appears in.

The unexpected signs in the interaction included equations is difficult to explain. Comparing the prenatal care coefficients in the interaction excluded 2SLS equation to those in the corresponding OLS equation, one finds a similar sign reversal, from unexpected signs in the OLS equation to expected signs in the 2SLS equations. Rosenzweig and Schultz attribute this sign reversal to the endogeneity of prenatal care utilization. A mother's health endowment influences birthweight but is unmeasured and so manifests itself through the disturbance term. If mothers can observe their own health endowments, and it is assumed they do, they can form expectations about their birth outcomes and adjust their prenatal care utilization to bring the expected birth outcome closer to the mother's desired birth outcome. It is this behavioral change on the mother's part that makes prenatal care demand endogenous to birthweight production. OLS estimation ignores this phenomenon and under-estimates the effect of prenatal care on birthweight production. 2SLS estimation corrects this phenomenon and accurately estimates the effect of prenatal care on birthweight production. Compare, this time, 2SLS and OLS prenatal care coefficients in the interaction included equations. One finds that the delay coefficient changes from weakly negative, (-.01 and -.02 in the substance included and excluded equations respectively), to strongly positive, relative to the OLS coefficients, (0.94 and 1.08 respectively), in the fixed effect equation. The visits coefficient becomes more negative; it doubles its magnitude while keeping its negative sign. Although, the coefficient is significant in the OLS estimation but insignificant in the 2SLS estimation. The interaction coefficient changed from significantly negative to significantly positive. When ignoring endogeneity, delay and visits were substitutes. When accounting for endogeneity they became complements. This might be acceptable if the same changes were observed in the entire sample equations, but they are not. The 2SLS interaction coefficient is more negative than the OLS interaction coefficient. In addition, compare the delay and visits coefficients in the OLS interaction excluded equation to those in the OLS interaction included equation. The delay coefficient changes from positive in the interaction excluded equation to negative, the expected sign, in the interaction included equation. The visits coefficient does not change sign, but does become less negative in the interaction included equation relative to the interaction excluded equation. The interaction variable shows the same effect on the delay and visits variables as it does in all of the entire sample equations. It is only in the 2SLS estimations that the predicted interaction variables has an unexpected effect on the predicted delay and predicted visits variables. This warrants further investigation into the observed and predicted interaction variables.

In the complete sample equations, it was found that the prenatal care coefficients in the substance use excluded equations were larger than those in the substance use included equations, implying that the predicted prenatal care variables were still correlated with the disturbance term. This phenomenon is again observed in the received prenatal care sample for the Black regression only, though the increase in magnitude of the coefficients is not as pronounced. In both samples compare the OLS prenatal care coefficients in the substance use included equations to those in the substance use excluded equations. The coefficients are almost identical. The observed prenatal care and substance use variables seem weakly correlated. The predicted prenatal care and observed substance use variables seem strongly correlated. The data confirm this supposition. In the complete sample, the correlations between the smoking variable and predicted delay, predicted visits, and predicted interaction are 0.13, -0.13, and -0.11, respectively. The correlations between smoking and the observed prenatal care variables, in the same order, are 0.07, -0.9, and -0.03, respectively. In the prenatal care only sample, the correlations between the smoking variable and predicted delay, predicted visits, and predicted interaction are 0.09, -0.09, and -0.08, respectively. The correlations between smoking and the observed prenatal care variables, in the same order, are 0.03, -0.6, and -0.02, respectively. The other three substance use variables are less strongly correlated with the predicted prenatal care variables than with the observed prenatal care variables.[11] The increase in the correlation between prenatal care and the smoking variable due to the 2SLS estimation is not unique to Blacks. It, therefore, cannot be used to explain the changes in the prenatal care coefficients in the substance use excluded equations. While this finding does not directly address the changes in the coefficient on the interaction variable from the entire sample to the prenatal care only sample, it does support the claim that the 2SLS estimation in the Black regression is introducing new correlation between the prenatal

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[11] For Whites, the corresponding correlations are 0.09, -0.05 and -0.06, and 0.03, -0.02, and -0.008 for the complete sample, and 0.09, -0.03, and -0.06, and 0.03, -0.02, and -0.006 for the prenatal care only sample. For Hispanics, the corresponding correlations are 0.09, -0.10 and -0.09, and 0.02, -0.05, and -0.008 for the complete sample, and 0.09, -0.10, and -0.08, and 0.02, -0.05, and -0.007 for the prenatal care only sample.

care and the substance use variables and perhaps prenatal care and the disturbance term. This phenomenon seems to be operating through the interaction variable because the increase in correlation is most pronounced in that variable.

The observed interaction variable is calculated as the observed number of visits divided by the observed days of delay. For those who received no prenatal care, the observed interaction would be zero since no visits results in a zero in the numerator. In the prenatal care only sample, these zero values are excluded. This should raise the mean value of the observed interaction and perhaps the predicted mean value as well. In fact, the observed and predicted means are larger in the prenatal care only sample than in the entire sample, for Blacks, Whites, and Hispanics. The exclusion of those who did not receive any prenatal care may also affect the correlations between the interaction and the delay and visits variables. In the entire sample, no visits implies maximum delay, so that long delay is associated with few visits; a negative correlation. In the prenatal care only sample, the no visits-maximum delay association is absent. If, among those who received care, there is a large enough component who had a long delay and then had many visits toward the end of the pregnancy, this negative correlation may be reduced, perhaps to the point of becoming positive. Such a change in the delay-visits correlation will also change the interaction-delay and interaction-visits correlations, perhaps enough to explain the unexpected prenatal care coefficient signs in the Black prenatal care only birthweight production equation. The data show a reduction in the strength of the negative correlation between delay and visits. For Blacks, the correlation between observed delay and observed visits falls in magnitude from 0.66 to 0.46. That of the predicted variables falls from 0.93 to 0.83.[12] The data also show that this has virtually no effect on the correlations between interaction and delay and visits. For Blacks, the observed visits-interaction and observed delay-interaction correlations change from 0.35 and -0.41, respectively, in the entire sample, to 0.32 and -0.39, in the prenatal care only sample. That of the predicted variables is from 0.94 and -0.96 to 0.92 and -0.95.[13] The effect of restricting the sample to only those who received prenatal care, in terms of the change in the correlations of the prenatal care variables is almost the same for Whites and Hispanics as it is for Blacks. This, therefore, cannot be the best explanation for the unexpected signs on predicted delay and predicted visits.

The marginal birthweight products for the prenatal care only sample shed additional light. For Hispanics, the marginal product of delay remains negative and the marginal

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[12] Whites show a similar decline from 0.51 to 0.39 and 0.85 to 0.74. For Hispanics, the decline is from 0.69 to 0.48 and 0.94 to 0.83. The correlations were the same for both the fixed effect and non-fixed effect predicted variables.

[13] Similar changes were observed for Whites and Hispanics.

product of visits more than doubles in magnitude and remains positive, compared to the complete sample marginal products. For Whites, the marginal product values for delay and visits are almost unchanged from the complete sample values.

The change is dramatic for Blacks. The marginal product of delay becomes positive and that of visits negative. All values have substantially decreased in magnitude. For Whites and Hispanics, there is benefit both from receiving some prenatal care versus no prenatal care and more care versus some care. In contrast, for Blacks, there is benefit only in receiving some care versus no care. There does not appear to appreciable benefit in receiving more care versus some care. The characteristics of mothers, and their birth outcomes, who receive at least some prenatal care would be of interest. However, the mean values of key variables do not reveal any insights. Means were calculated for those who use prenatal care intensively; mothers who receive more than the recommended amount of care for their gestation. These means reveal insights. For Blacks, the rate low weight births was 21.2%, more than the low birthweight rate for those mothers who did not receive any prenatal care, over half were delivered pre-term, and the mean birthweight was only 21 grams more than that for those who received no prenatal care. Intensive use of prenatal care is a very strong indicator of a problem pregnancy and is highly correlated with poor birth outcomes. This correlation may be what is driving the unexpected signs on the prenatal care coefficients in the prenatal care only equations. The no prenatal care rate exceeds the intensive use rate. This means that in the complete sample, poor birth outcomes are more heavily weighted at the no care end of the spectrum than at the intensive use of care end. When the no care births are excluded, the intensive use of care end of the spectrum becomes more heavily weighted than the low use end.[14] Unfortunately, the predominance of intensive use of care births in the prenatal care only sample is not an adequate explanation of the unexpected prenatal care coefficients signs in the Black birthweight production equations, for two reasons. First, the positive correlation between intensive use of care and poor birth outcomes is observed for Whites and Hispanics as well as Blacks, while the unexpected signs are observed only for Blacks. Second, the correlation just described above, is the very correlation that Rosenzweig and Schultz argue should only be observed in the OLS estimations because it is eliminated by the 2SLS estimation method.

The author has not been able to adequately explain the results of the Black regression in the prenatal care only sample. It appears that the predicted interaction variable is correlated with an unknown variable that is associated with prenatal care use and poor birth outcomes. The likelihood of

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[14] 22.2% of White low weight births are to mothers who use prenatal care intensively. 11.5 and 11.6 are the percentages for Blacks and Hispanics, respectively.

obtaining prenatal care is not uniformly distributed throughout the population. The above results may be due to sample selection bias. Controlling for the likelihood of receiving care using the Heckman method may give the expected signs on the prenatal care coefficients in question. It may also illuminate some of the unobserved characteristics of mothers who do not receive care compared to those mothers who do receive care or use care intensively.

Comparing the F-scores and the coefficients of determination for the prenatal care only sample to those of the complete sample shows that both statistics decrease in all equations for all three regressions. Explaining the benefit of receiving some prenatal care versus not receiving any prenatal care seems to be a significant aspect of these equations.

The joint hypotheses tests on the fixed effect variables do not yield as uniform results. In all three regressions, the F-scores for the prenatal care demand equations increased over those in the complete sample equations, remaining significant at 1%. In the White regression, the F-scores of the birthweight production equation remained the same. The null hypothesis was rejected at a 1% level of significance in all equations, as was the case in the complete sample equations. In the Hispanic regression, the F-scores of the birthweight production equations decreased. As in the White regression, the null hypothesis was rejected at a 1% level of significance in all equations, again, as in the complete sample equations. In the Black regression, the F-scores for the birthweight production equations decreased substantially. The null hypothesis was not rejected at a 5% level of significance in the two interaction included equations. The substance and interaction included equation rejected at 5%, but not at 1%. The substance excluded and interaction included equation was the only F-score to remain significant at 1%, though its value decreased from 21.3 to 4.7. For Blacks, it appears that the cohort variables have more of an impact on whether a mother receives prenatal care or not than on how much care she receives, given that she is already receiving care.

The same Wu exogeneity tests were also performed in the prenatal care only sample. In the White regression, the F-scores remained approximately the same in all four birthweight production equations, rejecting the null hypothesis of exogeneity at a 1% level of significance. In the Hispanics regression, the F-scores decreased in all the equations. However, they remained large enough to reject exogeneity in all the equations. In the Black regression, the F-scores decreased in all four birthweight production equations. In the interaction included equations, the F-scores remained large enough to reject exogeneity at 1%. In the interaction excluded equations exogeneity is not rejected at 1% in any equation, but is rejected at 5%.

The Wu-Hausman exogeneity tests on the individual delay and visits variables show more dramatic changes. In the White regression, exogeneity for visits is again rejected a 1%, the Chi-squared values increasing substantially. Exogeneity for delay is rejected at 1% in the fixed effect equation, as in the complete sample, but is rejected at 1% in the fixed effect equation. The results are similar for Hispanics. Exogeneity for visits is again rejected at 1%, the Chi-squared scores doubling. Exogeneity for delay is rejected, as in the complete sample, at 5% for the interaction included equations only. Exogeneity for delay is not rejected at 5% in the interaction excluded equations. There are significant changes in the Black regression. Exogeneity for visits is no longer rejected only in the fixed effect equations, it is rejected at 5% in only the interaction excluded equations, for both fixed and non-fixed effects. Exogeneity for delay is now not rejected at 5% in any equation. For Blacks, prenatal care appears endogenous mostly for obtaining some care, not for obtaining more care, given that some is already being received. For Whites and Hispanics, prenatal care, visits in particular, appears endogenous at all levels of care received.

The Hispanic regressions include a dummy variables for race to test if there are Black/White race differences within the Hispanic ethnicity. In both the complete and prenatal care only samples, the race coefficient in the delay equation is insignificantly negative, implying no racial difference.

However, the race coefficient in the visits equation is significantly positive, indicating that Black Hispanics obtain more visits, ceteris paribus, that White Hispanics. The coefficient is never significant in any birthweight production equation, implying that race is not an important factor affecting birth outcomes for Hispanics. However, the coefficient is always positive, suggesting that Black Hispanic mothers have better birth outcomes than otherwise identical White Hispanic mothers.

This result was unexpected because many Latin American countries, such as Batista's Cuba, Panama, and especially Brazil, have a very high degree of class differentiation.[15] Whites, those of European descent, monopolize the upper ruling class, non-Whites, those of African descent and Native Americans, occupy the working class, and there is very little class mobility. In most of these countries class and race have merged to become synonymous. The United States has a very different set of race/class values. Immigrants from Latin America, like all immigrants, do not change their race/class values very quickly and cannot be expected to immediately endorse American concepts of race. This supposition is supported by evidence from the 1980 and 1990 censuses.

In the sample for this dissertation, 84% of Hispanics are

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[15] Brazil was the last country in the world to officially abolish slavery in 1898, and it has the world's largest Black population outside Africa.

identified as White, 14% as Black, and 1% as Other. In the 1980 census, 40% of Hispanics were identified as Other, (Rodriguez, 1992). In the 1990 census, 37.6 % of Hispanics were identified as White, 13.4 % as Black, and 47.8% as Other.[16] The immediate question is why is there such a discrepancy between the birth certificate data and the census data regarding the racial composition of Hispanics.[17] Rodriquez, (1992), supplies the answer. After the 1980 census, the Census Bureau used its own personnel to re-interview those respondents who classified their race as Other. The Census enumerators re-classified 90% of this group as White race. "(S)elf reported race elicited an 'Other' response, but racial classification by the predominantly Anglo interviewers resulted in greater classification as White ...", (Rodriguez, p. 933).[18]

Racial identification and classification is considered necessary in order to test whether genetic differences between

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[16] The author calculated the 1990 figures from the 1990 census data for the five boroughs of New York City.

[17] The instructions for completing the New York City birth certificate fails to address the race of the child. An official at the Bureau of Vital Records informed the author that the race of the child is specified by the parents. This information begs the question as to why over 40% of Hispanic parents identify themselves as Other on the census but identify their children as White on the birth certificate.

[18] The comment of 'Anglo interviewers' by Rodriguez points out another dimension confusing the race issue. In Canada and the United States, but much less so in European countries, individuals from all racial groups tend to equate White with Anglo-Saxon ethnicity rather than with European descent.

the races have a significant effect on birthweight production. On its surface, this is not wrong. However, racial classification based on physical appearance, such as skin color, hair texture, etc, raises two issues. First, the author suspects that the high level of rigor applied by the Census Bureau to Hispanic physical appearance is not universal. In the Black race, there is a wide range of skin colors, hair textures, facial structures. Some individuals who self identify as Black have enough Caucasoid features to "pass" for White. The Census Bureau has not re-interviewed such Blacks to reclassify them as White. Second, and more important, is the evidence that suggests that differences in the physical appearances of the races are not a reliable indicators of other genetic differences. For example, a genetic trait more relevant to pregnancy than race, is blood type. All blood types are represented in the three traditional racial groups, (Futuyama, 1986). Furthermore, "(o)f the more than 150 protein and blood group loci that have been examined by electrophoresis and related techniques, 75% are monomorphic throughout the world's population, and among the variable loci, there is no fixed locus that is fixed for different alleles in different 'races'.", (Futuyama, p. 522). In English, the previous sentence says that of the protein and blood group gene sites on DNA which have been located, 75% are identical for all humans examined. Of the 25% which are not identical for all humans, none were identical within a 'race' for each of the three 'races' and different across the 'races'. Geneticists feel that this type of data support the claim that "there is little reason to assume that traits other than skin color, hair form, and the like will vary substantially among 'races'. For example, there is no reason to expect mental abilities to vary among 'races' any more than protein-encoding loci or the structure of the hand ... ", (Futuyama, p.522). The author feels that there is also little reason to expect birthweight production to vary substantially among the 'races' due to genetics.

Despite the above, there is still a legitimate reason to classify mothers by race. In the U.S., race has highly political overtones. This politicization of race is not lost on some Hispanics. One Caucasian looking Hispanic woman self identifies as Other because "I don't consider myself White because of my political consciousness. I reject this political label of White.", (Rodriguez, p. 935). The Social-Conflict paradigm in the field of sociology supports a political interpretation of race. When resources used for prenatal care, such as Medicaid, are determined politically, political classifications become extremely relevant.

The native South American and Caribbean Indians, the immigrant Europeans, Africans, and Asians, have lived with each other for several hundred years, inter-mating and exchanging ideas and values. The concept of race which characterizes the society that has developed, a concept heavily laden with class overtones, does not fall neatly into the American concept of race, heavily laden with political overtones. The insignificant coefficient in the Hispanic birthweight production equations represents an unsuccessful attempt to figuratively fit a square peg in a round hole.

The coefficients on the year dummies, while not central to this dissertation, contain an interesting, if not disturbing, result. The birthweight year dummy coefficients for the two equations in the complete sample, display no pattern consistent across the three regressions. There appears to have been no secular change in birthweight for any race in the 80's decade.

The year dummy coefficients for prenatal care demand in the complete sample, show a different story. The non-fixed effect prenatal care delay equation coefficients show no consistent pattern from 1981 through 1987. From 1988 through 1990, there is a significant decrease in delay for all three regressions. For Whites the delay decrease averages 12 days, for Blacks it is an average of 17 days, and for Hispanics an average of 35 days. In the fixed effect prenatal care delay equation, the year dummy coefficients show a steady gradual decrease in delay from 1981 through 1987 for all three regressions. From 1988 through 1990, there is again a large decrease in delay, averaging 18 days for Whites, 23 days for Blacks, and 43 days for Hispanics. These changes in delay coincide with the adoption of a new birth certificate by the

New York City Dept. of Vital Statistics. There may have been a change in NYC Health Dept. prenatal care policy in 1987. The author fears that there was an undisclosed change in the method of measuring prenatal care delay with the adoption of the new birth certificates. Since the year dummies have accounted for any such policy change, the other regression coefficients are unaffected and remain valid.

The year dummy coefficient for the prenatal care visits equations display a similar pattern. For Hispanics the pattern is identical. In the non-fixed effect equation, there is no significant change in the number of visits from the 1980 number until 1988. From 1988 through 1990, Hispanics averaged 1.34 more visits than in 1980. In the fixed effect equation, there is a small steady increase in the number of visits until 1987. From 1988 through 1990, the number of visits averages 1.70 more than in 1980. For Whites , the increase is not as pronounced as for Hispanics, averaging 0.73 increase for the non-fixed effect equation and a 1.27 increase for the fixed effect equation. For Blacks, however, no increase in visits is observed. There was no secular change in the number of prenatal care visits Black mothers made during the 80's decade.

In the prenatal care only sample, very similar patterns were observed.

VI Conclusion and Policy Recommendations

The mains points identified by these results is that prenatal care delay and prenatal care visits are substitutes in the production of birthweight, that delay is a much less important component of prenatal care than is the number of visits, and that Black women are not very responsive to their health endowments.

The implications to policies designed to reduce low birthweight are that such policy should encourage frequent prenatal care visits and careful observance of their obstetrician's advice and instructions, especially for women who have experienced reproductive difficulties.

The issue of prenatal care quality needs to be addressed. The low productivity of prenatal care for Blacks, especially when compared to Hispanics, points out the quantity of prenatal care is not a sufficient measure. A prenatal care quality index is needed to accompany the already existing prenatal care quantity indices.

Providing Black women with more reproductive information would be one aspect of improving prenatal care quality. Such information might include the impact that miscarriages have on subsequent birth outcomes, and emphasize the need for women who have had miscarriages to consult an obstetrician before becoming pregnant again and to consult an obstetrician early and frequently once pregnant again. The impact that an absent father has on birth outcomes should also be stressed. All women, but teenagers in particular, need to realize that the choice of a father is an important one.

The results suggest that Medicaid policy, for example, is counter productive. For Blacks and Hispanics, receiving Medicaid reduces delay compared to self-paying, but, for Whites and Blacks, receiving Medicaid also reduces the number of visits compared to self-paying. Medicaid, it seems, and especially so for Blacks, encourages an unproductive behavior, (starting care early), and does not encourage a productive one, (making frequent visits). It may be that unobservables which are positively correlated with the likelihood of receiving Medicaid are negatively correlated with prenatal care demand.

Some minor points are suggested by the previous analysis and the tables in Appendix G. One minor point concerns delay. For Whites the mode was almost always the ninth week of pregnancy. For Blacks and Hispanics, whose mode was often the 39th week, ie. no prenatal care, the second most frequent observation was almost always the ninth week of pregnancy. The author interprets this to mean that it is after the second missed menstrual period that large numbers of women become concerned about a possible pregnancy. It appears that the first missed menstrual period is being attributed to other factors, despite the mother being sexually active. This pattern of behavior would be consistent with unintentional pregnancies, perhaps due to contraceptive failure. Since pregnancy wantedness has a significant effect on birthweight, more education about the types of contraceptives and how to use them effectively might improve birth outcomes by increasing the proportion of wanted births.

A second minor point concerns prenatal care visits. The mode is 10 visits for almost all sub-groups. The birthweight mode is 3300 grams for almost all sub-groups. These findings indicate that large numbers of women are having normal weight first births while having substantially less than the recommended number of prenatal care visits. It suggests that the ACOG recommendation of 14 visits for an uncomplicated pregnancy is excessive. The birth outcomes of the intensive use sub-group are poor despite receiving more than the recommended amount of care. The resources that society allocates to prenatal care provision might improve overall birth outcomes if less care was allocated to the more healthy mothers and more care to the less healthy mothers.

The universality of the 10 visits mode may also be due to the structure of prenatal care insurance.[19] The co-insurance rate for prenatal care visits, for privately supplied health insurance, may rise after 10 visits. This would put a discontinuity into the demand curve for visits at the tenth visit. This discontinuity would explain the 'bunching' observed at the tenth visit.

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[19] 82.7% of White births were paid for using private insurance. The proportions were 44.2% and 41.4% for Blacks and Hispanics, respectively. Comparison with the visits histogram shows that the frequency of 10 visits and the use of private insurance are positively correlated.

APPENDIX A

Description of Variables

Birthweight	The weight, in grams, of an infant.
Prenatal care delay	The time, in days, from conception to the first prenatal care visit. If no visits were made then delay = 273.
Predicted prenatal	The predicted time, in days, from conception to care delay the first prenatal care visit.
Prenatal care visits	The number of prenatal care visits the mother made during the pregnancy.
Standardized Prenatal care visits	The number of prenatal care visits that would have been made had the gestation dured 39 weeks.
Predicted prenatal care visits	The predicted number of prenatal care visits that would have been made in a 39 week pregnancy.
Interaction	The standardized number of prenatal care visits divided by the length of prenatal care delay.
Predicted Interaction	The predicted value for prenatal care visits divided by the length of prenatal care delay.
Miscarriages, early	The number of miscarriages during the first 13 weeks of pregnancy before the first live birth.
Miscarriages, late	The number of miscarriages after the first 13 weeks of pregnancy before the first live birth.
Plurality	A dichotomous variable that equals one if the birth is not a singleton.
Mother's age	A dichotomous variable that equals one if a woman had her first child before 21 years of age.

Mother's education	
< 7 yrs	A dichotomous variable that equals one if the mother did not complete elementary school.
7 - 11	A dichotomous variable that equals one if the mother did not complete high school.
13 - 15	A dichotomous variable that equals one if the mother completed at least one year of college.
> 15	A dichotomous variable that equals one if the mother graduated from a four-year college.
missing	A dichotomous variable that equals one if the mother's education value is missing.
Father's education	
< 7 yrs	A dichotomous variable that equals one if the father did not complete elementary school.
7 - 11	A dichotomous variable that equals one if the father did not complete high school.
13 - 15	A dichotomous variable that equals one if the father completed at least one year of college.
> 15	A dichotomous variable that equals one if the father graduated from a four-year college.
missing	A dichotomous variable that equals one if the father's education value is missing.
Mother's marital	A dichotomous variable that equals one if the status mother was single as at the date of first birth.
Male Sex	A dichotomous variable that equals one if the infant is a boy.
Financing;	
Medicare	A dichotomous variable that equals one if the birth was paid for by Medicare.
Self-pay	A dichotomous variable that equals one if the birth was paid for by the mother.

missing	A dichotomous variable which equals one if the financial coverage value is missing.
Private service	A dichotomous variable that equals one if a private physician performed the delivery.
Foreign born	A dichotomous variable that equals one if the mother was born outside the continental U.S.
Narcotics use	A dichotomous variable that equals one if the pregnancy is complicated by narcotics use.
Alcohol use	A dichotomous variable that equals one if the pregnancy is complicated by alcohol use, ie. having more than 2 drinks per week.
Tobacco use	A dichotomous variable that equals one if the pregnancy is complicated by tobacco use, ie. smoking more than 10 cigarettes per day.
Other drug use	A dichotomous variable that equals one if the pregnancy is complicated by other drug use.
Family planning	The number of family planning clinics per 10,000 clinics women between 15 and 44 years of age in a health area in the year of birth.
Prenatal care	The number of prenatal care clinics per 10,000 clinics women between 15 and 44 years of age in a health area in the year of birth.
Poverty rate	The percentage of persons of a specific race or ethnicity living below the poverty level in the health area of residence in the year of birth.
Unemployment	The unemployment rate in the borough of residence in the year of birth.

Drug Deaths	The number of deaths due to drug use per 100,000 residents in the health district of residence in the year of birth.
Black Race (Hispanics Only)	A dichotomous variable that equals one if the mother is Black.

APPENDIX B

TABLE I MEANS - Complete Sample

variable	Blacks	Hispanics	Whites
Birthweight (grams)	3,118	3,225	3,331
Prenatal Care Delay (days)	127	132	83
Prenatal Care Visits	7.7	7.9	10.0
Single mothers (%)	69.0	51.9	12.3
High School Grads (%)	70.7	59.9	93.0
Teenage mothers (%)	37.2	35.6	9.8
Low Birthweight (%)	11.5	8.1	5.9
Pre-Term Delivery (%)	15.1	12.0	7.6
Family Planning Clinics	1.12	1.13	0.67
Prenatal Care Clinics	0.91	0.80	0.61
Poverty Rate	27.0	35.2	11.7
Unemployment Rate	7.8	7.7	7.5
Drug Deaths	11.8	10.9	6.0
Foreign Born (%)	43.5	69.8	29.9
No Prenatal Care (%)	9.2	10.8	2.2
Number of births	51,186	47,291	63,594
Black Hispanic (%)		14.3	
White Hispanic (%)		84.1	

TABLE II MEANS - Prenatal Care Only Sample

variable	Blacks	Hispanics	Whites
Birthweight (grams)	3,140	3,243	3,330
Prenatal Care Delay (days)	112	115	83
Prenatal Care Visits	8.5	8.8	10.0
Single mothers (%)	67.6	50.0	12.5
High School Grads (%)	71.9	61.8	93.1
Teenage mothers (%)	36.2	34.5	10.0
Low Birthweight (%)	10.6	7.5	5.9
Pre-Term Delivery (%)	14.3	11.3	7.6
Family Planning Clinics	1.08	1.07	0.66
Prenatal Care Clinics	0.89	0.78	0.61
Poverty Rate	26.4	34.4	11.5
Unemployment Rate	7.8	7.6	7.5
Drug Deaths	11.6	10.7	6.0
Foreign Born (%)	44.8	70.3	30.1
Number of births	46,496	42,213	63,852
Black Hispanic (%)		14.3	
White Hispanic (%)		84.1	

TABLE III MEANS - No Prenatal Care Sample

variable	Blacks	Hispanics	Whites
Birthweight (grams)	2,905	3,079	3,065
Prenatal Care Delay (days)	-	-	-
Prenatal Care Visits	-	-	-
Single mothers (%)	82.8	67.4	46.5
High School Grads (%)	54.0	43.6	75.7
Teenage mothers (%)	47.2	45.1	30.0
Low Birthweight (%)	20.8	12.6	16.5
Pre-Term Delivery (%)	23.0	17.3	17.7
Family Planning Clinics	1.41	1.58	0.78
Prenatal Care Clinics	1.06	0.95	0.65
Poverty Rate	32.9	41.8	17.6
Unemployment Rate	8.3	8.1	7.8
Drug Deaths	13.8	12.0	7.6
Foreign Born (%)	30.8	65.6	38.7
Number of births	4,724	5,103	1,443
Black Hispanic (%)		14.9	
White Hispanic (%)		84.1	

TABLE IV MEANS - Intensive Use Sample (Standardized visits > 14)

variable	Black	Hispanic	White
Birthweight (grams)	2,926	3,095	3,124
Prenatal Care Delay (days)	73	77	59
Prenatal Care Visits	14.6	15.1	15.5
Standardized Visits	17.6	16.9	16.9
Single mothers (%)	63.2	46.3	9.7
High School Grads (%)	78.3	67.1	96.1
Teenage mothers (%)	29.2	28.8	5.6
Low Birthweight (%)	21.2	15.6	14.4
Pre-Term Delivery (%)	52.5	37.4	14.4
Gestation (days)	254	260	264
Family Planning Clinics	1.12	0.99	0.72
Prenatal Care Clinics	1.00	0.79	0.69
Poverty Rate	25.6	33.2	19.7
Unemployment Rate	7.4	7.4	7.2
Drug Deaths	13.8	11.9	6.8
Foreign Born (%)	46.4	69.9	29.7
Proportion of (%) Complete Sample	5.2	5.0	8.6
Number of births	2,661	2,372	5,446
Black Hispanic (%)		14.2	
White Hispanic (%)		84.2	

APPENDIX C COEFFICIENTS - Complete Sample

Prenatal Care Delay Equation (Whites)

variable	(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept	78.95	37.32	141.87	7.57
Mother's Education < 7	17.73	6.47	17.52	6.40
7 - 11	8.53	8.53	7.59	7.58
13 - 15	-3.06	4.40	-2.76	3.98
> 15	-1.90	2.64	-0.54	0.74
value is missing	-12.10	8.38	10.61	7.34
Father's Education < 7	-0.88	0.31	-4.99	1.81
7 - 11	3.77	3.41	3.59	3.23
13 - 15	-2.97	4.05	-3.16	4.31
> 15	-1.69	2.26	-0.62	0.83
value is missing	20.08	18.00	19.26	17.20
Self-pay	16.90	24.00	16.72	23.45
Medicaid	25.55	28.20	23.31	25.89
value is missing	16.21	10.34	14.72	9.53
Prenatal care clinics	-1.78	5.99	-1.42	4.85
Family planning clinics	1.24	4.33	1.18	4.14
Unemployment rate	-0.66	2.75	-0.76	3.16
Poverty rate	0.37	12.43	0.36	12.26
Drug deaths	0.22	4.61	0.27	5.81
Early Miscarriages	1.45	2.03	1.73	2.51
Late Miscarriages	-6.79	3.91	-2.22	1.24
Teenage mother	18.26	23.34	12.03	12.36
Single mother	21.72	26.67	22.92	28.02
Plurality	-6.80	3.37	-4.00	2.01
Foreign Born	9.55	18.48	10.37	20.16
value is missing	2.26	0.26	-12.98	1.59
F value / adj-R^2	334.49	.1903	322.24	.1924
Cohort	-	-	-2.85	4.37
Cohort squared	-	-	0.03	5.40

F value for the fixed effect variables 87.1011 (p=0.0001)

Prenatal Care Visits Equation (Whites)

variable	(without fixed effect) coefficient	(without fixed effect) |t|	(with fixed effect) coefficient	(with fixed effect) |t|
Intercept	10.54	72.31	13.09	10.10
Mother's				
Education < 7	-0.71	3.72	-0.90	4.73
7 - 11	-0.43	6.05	-0.33	4.73
13 - 15	0.24	5.05	0.20	4.22
> 15	0.30	5.95	0.17	3.28
value is missing	1.13	11.38	0.79	7.88
Father's				
Education < 7	-0.28	1.40	-0.02	0.10
7 - 11	-0.20	2.67	-0.16	2.12
13 - 15	0.15	2.97	0.08	1.61
> 15	0.25	4.88	0.26	5.09
value is missing	-0.87	11.24	-0.83	10.77
Self-pay	0.04	0.87	0.04	0.91
Medicaid	-0.75	12.00	-0.63	10.16
value is missing	-0.68	6.23	-0.57	5.34
Prenatal care clinics	0.07	3.28	0.04	2.18
Family planning clinics	-0.03	1.27	-0.01	0.68
Unemployment rate	-0.17	10.36	-0.19	10.75
Poverty rate	-0.02	8.50	-0.01	7.03
Drug deaths	-0.01	1.67	-0.01	2.81
Early Miscarriages	0.15	3.13	0.10	2.14
Late Miscarriages	0.74	6.17	0.59	4.75
Teenage mother	-0.56	10.32	-0.03	0.51
Single mother	-0.53	9.47	-0.60	10.54
Plurality	2.57	18.39	2.29	16.70
Foreign Born	-0.36	9.98	-0.41	11.56
value is missing	-0.88	1.50	-0.14	0.25
F value / adj-R^2	143.29	.0915	144.31	.0964
Cohort	-	-	-0.02	0.53
Cohort squared	-	-	-0.001	1.05

F value for the fixed effect variables 178.7880 (p=0.0001)

Birthweight Production Equation - 2SLS (Whites)

variable	(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept	3206.63	23.88	2707.08	10.79
Predicted Prenatal Care Delay	-1.03	1.42	-1.49	2.17
Predicted Prenatal Care Visits	26.59	2.33	28.29	2.50
Predicted Prenatal Care Interaction	-883.81	1.45	-890.33	1.55
Mother's Education < 7	8.54	0.29	17.27	0.59
7 - 11	13.93	1.14	12.45	1.02
13 - 15	20.45	2.64	21.86	2.83
> 15	-23.47	2.46	-14.89	1.62
value is missing	-9.25	0.54	-5.74	0.34
Father's Education missing	-23.64	1.68	-12.84	0.88
Narcotics	-246.18	7.81	-242.59	7.66
Alcohol	230.53	9.20	229.48	9.12
Smoking	-53.63	3.56	-53.15	3.51
Other Drugs	-32.34	1.78	-28.03	1.53
Early Miscarriages	-12.70	1.41	-9.09	1.03
Late Miscarriages	-45.43	2.19	-44.80	2.15
Male sex	122.87	25.41	122.87	25.31
Single mother	-47.21	4.04	-35.25	2.89
Plurality	-878.71	27.04	-880.17	27.57
Private Service	53.41	6.91	53.83	6.91
Foreign Born	-2.53	0.39	4.25	0.62
value is missing	-152.63	1.66	-158.03	1.71
F value / adj-R^2	83.45	.0498	78.83	.0498
Cohort	-	-	14.48	1.95
Cohort squared	-	-	-0.09	1.39

F value for the fixed effect variables 15.4209 (p=0.0001)

Wu Exogeneity Test	F value	(p value)	F value	(p value)
Prenatal Care (group)	7.3820	(0.0001)	9.6113	(0.0001)

Birthweight Production Equation - 2SLS (Whites)

variable	(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept	3088.11	30.28	2693.82	11.22
Predicted Prenatal Care Delay	-0.12	0.34	-0.58	1.69
Predicted Prenatal Care Visits	16.60	1.90	17.83	2.05
Predicted Prenatal Care Interaction	-	-	-	-
Mother's Education < 7	-1.13	0.04	7.04	0.26
7 - 11	6.87	0.64	4.91	0.46
13 - 15	21.84	2.97	23.33	3.18
> 15	-30.61	3.92	-22.24	2.94
value is missing	-6.06	0.37	-2.48	0.15
Father's Education missing	-30.66	2.42	-20.13	1.52
Narcotics	-245.56	8.14	-241.89	7.98
Alcohol	230.03	9.59	228.88	9.50
Smoking	-53.79	3.73	-53.24	3.68
Other Drugs	-32.60	1.87	-23.39	1.62
Early Miscarriages	-18.45	2.48	-15.26	2.02
Late Miscarriages	-44.36	2.23	-43.59	2.19
Male sex	122.87	25.55	122.87	26.45
Single mother	-49.63	4.48	-38.02	3.29
Plurality	-896.35	31.07	-897.15	31.25
Private Service	53.46	7.23	53.85	7.22
Foreign Born	-1.60	0.26	5.04	0.77
value is missing	-141.90	1.62	-147.58	1.68
F value / adj-R^2	93.77	.0541	88.45	.0541
Cohort	-	-	11.00	1.62
Cohort squared	-	-	-0.06	1.02

F value for the fixed effect variables 15.7267 (p=0.0001)

Wu Exogeneity Test	F value	(p value)	F value	(p value)
Prenatal Care (group)	10.0780	(0.0001)	13.2161	(0.0001)

Birthweight Production Equation - 2SLS (Whites)

variable	(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept	3211.77	24.21	2735.14	11.02
Predicted Prenatal Care Delay	-1.00	1.39	-1.46	2.15
Predicted Prenatal Care Visits	23.25	2.06	26.32	2.35
Predicted Prenatal Care Interaction	-772.37	1.28	-776.29	1.37
Mother's Education < 7	11.06	0.38	21.08	0.72
7 - 11	14.27	1.18	13.01	1.08
13 - 15	21.63	2.83	22.70	2.98
> 15	-23.86	2.54	-15.52	1.70
value is missing	-5.14	0.30	-2.54	0.15
Father's Education missing	-28.57	2.06	-16.41	1.14
Narcotics	-	-	-	-
Alcohol	-	-	-	-
Smoking	-	-	-	-
Other Drugs	-	-	-	-
Early Miscarriages	-13.93	1.57	-10.29	1.18
Late Miscarriages	-45.83	2.23	-45.91	2.23
Male sex	123.35	25.82	123.36	25.68
Single mother	-50.97	4.42	-37.97	3.15
Plurality	-876.39	27.29	-880.95	27.89
Private Service	57.94	7.60	58.23	7.57
Foreign Born	-2.05	0.32	5.49	0.81
value is missing	-156.32	1.72	-161.40	1.77
F value / adj-R^2	91.87	.0485	86.09	.0484
Cohort	-	-	13.08	1.78
Cohort squared	-	-	-0.07	1.19

F value for the fixed effect variables 16.7367 (p=0.0001)

Wu Exogeneity Test	F value	(p value)	F value	(p value)
Prenatal Care (group)	6.5621	(0.0003)	24.3223	(0.0001)

Birthweight Production Equation - 2SLS (Whites)

variable	(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept	3108.18	30.51	2723.54	11.34
Predicted Prenatal Care Delay	-0.20	0.57	-0.67	1.94
Predicted Prenatal Care Visits	14.52	1.66	17.20	1.98
Predicted Prenatal Care Interaction	-	-	-	-
Mother's Education < 7	2.60	0.10	12.15	0.44
7 - 11	8.09	0.75	6.44	0.60
13 - 15	22.85	3.11	23.97	3.27
> 15	-30.10	3.86	-21.93	2.90
value is missing	-2.35	0.14	0.30	0.02
Father's Education missing	-34.70	2.75	-22.75	1.72
Narcotics	-	-	-	-
Alcohol	-	-	-	-
Smoking	-	-	-	-
Other Drugs	-	-	-	-
Early Miscarriages	-19.31	2.55	-15.68	2.07
Late Miscarriages	-44.91	2.26	-44.86	2.25
Male sex	123.34	26.68	123.35	26.53
Single mother	-53.08	4.80	-40.37	3.49
Plurality	-891.80	30.95	-895.76	31.18
Private Service	57.98	7.86	58.23	7.82
Foreign Born	-1.23	0.20	6.18	0.94
value is missing	-156.32	1.72	-152.28	1.73
F value / adj-R^2	101.44	.0516	94.77	.0515
Cohort	-	-	10.05	1.48
Cohort squared	-	-	-0.05	0.85

F value for the fixed effect variables 16.9721 (p=0.0001)

Wu Exogeneity Test	F value	(p value)	F value	(p value)
Prenatal Care (group)	9.1208	(0.0001)	34.7882	(0.0001)

Birthweight Production Equation - OLS (Whites

variable	(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept	3452.77	230.58	3071.27	17.02
Prenatal Care Delay	-0.85	15.84	-0.86	15.87
Prenatal Care Visits	-15.88	20.79	-15.73	20.55
Prenatal Care Interaction	-48.31	4.36	-48.68	4.40
Mother's Education < 7	-25.23	0.97	-25.42	0.98
7 - 11	-7.16	0.74	-9.45	0.96
13 - 15	32.86	4.86	34.47	5.07
> 15	-16.36	2.36	-12.47	1.77
value is missing	15.75	1.04	19.19	1.27
Father's Education missing	-46.99	4.14	46.63	4.10
Narcotics	-250.31	8.45	-249.74	8.42
Alcohol	227.58	9.67	226.63	9.63
Smoking	-58.47	4.14	-58.24	4.12
Other Drugs	-15.95	0.93	-14.26	0.83
Early Miscarriages	-12.57	1.73	-11.45	1.57
Late Miscarriages	-25.42	1.35	-24.46	1.30
Male sex	123.52	27.21	123.55	27.22
Single mother	-61.09	7.03	-60.94	6.98
Plurality	-820.77	39.05	-819.66	39.44
Private Service	40.51	5.61	39.07	5.78
Foreign Born	11.10	2.06	-10.55	1.96
value is missing	-161.45	1.88	-161.84	1.89
F value / adj-R^2	110.46	.0643	104.64	.0645
Cohort	-	-	20.15	3.19
Cohort squared	-	-	-0.16	2.92

F value for the fixed effect variables 5.5149 (p=0.0040)

Birthweight Production Equation - OLS (Whites)

	(without fixed effect)		(with fixed effect)	
variable	coefficient	|t|	coefficient	|t|
Intercept	3447.98	230.85	3073.25	17.03
Prenatal Care Delay	-0.81	15.27	-0.81	15.29
Prenatal Care Visits	-16.68	22.47	-16.53	22.23
Prenatal Care Interaction	-	-	-	-
Mother's Education < 7	-25.87	1.00	-26.07	1.00
7 - 11	-7.54	0.78	-9.83	1.00
13 - 15	32.99	4.88	34.58	5.09
> 15	-16.66	2.40	-12.83	1.82
value is missing	16.13	1.07	19.54	1.29
Father's Education missing	-47.48	4.18	-47.12	4.15
Narcotics	-250.99	8.47	-250.41	8.45
Alcohol	227.03	9.66	226.09	9.61
Smoking	-58.35	4.13	-58.12	4.11
Other Drugs	-15.97	0.93	-14.30	0.84
Early Miscarriages	-12.86	1.77	-11.75	1.62
Late Miscarriages	-25.19	1.33	-24.25	1.28
Male sex	123.50	27.20	123.53	27.21
Single mother	-61.12	7.03	-60.98	6.98
Plurality	-821.16	39.07	-820.07	39.01
Private Service	41.24	5.72	42.80	5.88
Foreign Born	11.10	2.06	-10.57	1.96
value is missing	-160.89	1.87	-161.27	1.88
F value / adj-R^2	113.19	.0640	107.05	.0641
Cohort	-	-	11.75	1.87
Cohort squared	-	-	-0.09	1.65

F value for the fixed effect variables 5.3693 (p=0.0047)

Birthweight Production Equation - OLS (Whites)

	(without fixed effect)		(with fixed effect)	
variable	coefficient	|t|	coefficient	|t|
Intercept	3449.55	230.43	3080.12	17.05
Prenatal Care Delay	-0.87	16.21	-0.88	16.26
Prenatal Care Visits	-15.80	20.68	-15.63	20.42
Prenatal Care Interaction	-48.24	4.35	-48.62	4.39
Mother's Education < 7	-20.39	0.78	-20.83	0.80
7 - 11	-5.72	0.59	-8.63	0.87
13 - 15	33.47	4.95	35.32	5.19
> 15	-16.40	2.36	-12.09	1.71
value is missing	18.35	1.22	22.20	1.46
Father's Education missing	-50.52	4.44	-50.16	4.41
Narcotics	-	-	-	-
Alcohol	-	-	-	-
Smoking	-	-	-	-
Other Drugs	-	-	-	-
Early Miscarriages	-13.16	1.81	-11.85	1.63
Late Miscarriages	-26.95	1.43	-25.87	1.37
Male sex	124.02	27.28	124.05	27.29
Single mother	-64.89	7.47	-64.93	7.44
Plurality	-820.75	39.00	-819.49	38.93
Private Service	44.32	6.14	46.16	6.35
Foreign Born	-10.22	1.90	-9.65	1.79
value is missing	-165.06	1.92	-165.57	1.93
F value / adj-R^2	119.44	.0616	112.39	.0618
Cohort	-	-	11.39	1.81
Cohort squared	-	-	-0.09	1.56

F value for the fixed effect variables 6.2323 (p=0.0020)

Birthweight Production Equation - OLS (Whites)

	(without fixed effect)		(with fixed effect)	
variable	coefficient	|t|	coefficient	|t|
Intercept	3444.76	230.70	3082.24	17.06
Prenatal Care Delay	-0.83	15.65	-0.83	15.69
Prenatal Care Visits	-16.59	22.35	-16.43	22.09
Prenatal Care Interaction	-	-	-	-
Mother's Education < 7	-21.02	0.81	-21.48	0.83
7 - 11	-6.11	0.63	-9.01	0.91
13 - 15	33.40	4.96	35.43	5.20
> 15	-16.70	2.41	-12.44	1.76
value is missing	18.73	1.24	22.55	1.49
Father's Education missing	-51.01	4.48	-50.66	4.45
Narcotics	-	-	-	-
Alcohol	-	-	-	-
Smoking	-	-	-	-
Other Drugs	-	-	-	-
Early Miscarriages	-13.45	1.85	-12.16	1.67
Late Miscarriages	-26.73	1.41	-25.65	1.36
Male sex	124.00	27.27	124.03	27.28
Single mother	-64.93	7.47	-64.98	7.44
Plurality	-821.15	39.01	-819.90	38.95
Private Service	45.06	6.25	46.90	6.45
Foreign Born	-10.22	1.90	-9.66	1.79
value is missing	-164.50	1.91	-165.01	1.92
F value / adj-R^2	122.87	.0613	115.36	.0614
Cohort	-	-	11.16	1.78
Cohort squared	-	-	-0.08	1.53

F value for the fixed effect variables 6.0815 (p=0.0023)

Prenatal Care Delay Equation (Blacks)

variable		(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept		100.17	27.32	-119.34	4.33
Mother's Education	< 7	19.55	6.67	20.78	7.09
	7 - 11	9.34	11.18	9.09	10.77
	13 - 15	-7.44	8.12	-7.79	8.52
	> 15	-7.89	5.73	-5.62	4.11
value is missing		8.84	4.10	9.61	4.46
Father's Education	< 7	4.63	1.07	5.42	1.25
	7 - 11	5.78	4.67	5.86	4.75
	13 - 15	-3.36	2.90	-3.43	2.97
	> 15	-2.26	1.47	-1.40	0.91
value is missing		7.46	8.65	7.62	8.87
Self-pay		14.58	15.48	14.38	15.22
Medicaid		19.56	13.53	9.47	12.05
value is missing		32.19	17.14	31.57	16.83
Prenatal care clinics		-1.19	3.30	-1.19	3.30
Family planning clinics		1.03	3.38	1.01	3.33
Unemployment rate		0.48	1.20	0.61	1.51
Poverty rate		0.27	8.88	0.25	8.29
Drug deaths		0.10	3.13	0.11	3.36
Early Miscarriages		-1.58	1.48	-0.94	0.88
Late Miscarriages		-5.68	3.52	-4.92	3.06
Teenage mother		10.61	13.94	5.77	5.34
Single mother		7.77	8.99	6.94	8.01
Plurality		-9.58	3.19	-9.03	3.01
Foreign Born		2.32	3.17	2.80	3.82
value is missing		2.54	0.29	10.65	2.47
F value / adj-R^2		148.49	.1015	145.97	.1047
Cohort		-	-	6.60	7.13
Cohort squared		-	-	-0.05	6.00

F value for the fixed effect variables 88.2205 (p=0.0001)

Prenatal Care Visits Equation (Blacks)

variable		(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept		11.55	53.15	29.93	18.33
Mother's Education	< 7	-0.63	3.63	-0.72	4.15
	7 - 11	-0.51	10.35	-0.52	10.44
	13 - 15	0.35	6.53	0.38	6.98
	> 15	0.19	2.30	0.06	0.72
value is missing		-0.24	1.89	-0.29	2.30
Father's Education	< 7	-0.06	0.23	-0.10	0.40
	7 - 11	-0.25	3.48	-0.26	3.55
	13 - 15	0.19	2.84	0.20	2.92
	> 15	0.18	1.96	0.13	1.39
value is missing		-0.55	10.83	-0.56	11.04
Self-pay		-0.13	2.36	-0.14	2.43
Medicaid		-0.48	10.49	-0.40	8.69
value is missing		-1.45	12.99	-1.40	12.59
Prenatal care clinics		0.06	2.98	0.06	2.95
Family planning clinics		-0.04	2.46	-0.04	2.36
Unemployment rate		-0.31	13.08	-0.32	13.42
Poverty rate		-0.03	14.17	-0.02	13.55
Drug deaths		-0.01	1.56	-0.01	1.95
Early Miscarriages		0.12	1.88	0.08	1.27
Late Miscarriages		0.95	9.92	0.90	9.42
Teenage mother		-0.22	4.94	-0.05	0.74
Single mother		-0.13	2.50	-0.09	1.70
Plurality		1.65	9.28	1.62	9.11
Foreign Born		-0.12	2.80	-0.15	3.51
value is missing		-1.52	2.94	-1.52	2.95
F value / adj-R^2		108.14	.0761	108.61	.0801
Cohort		-	-	-0.58	10.54
Cohort squared		-	-	0.004	9.49

F value for the fixed effect variables 108.6788 (p=0.0001)

Birthweight Production Equation - 2SLS (Blacks)

	(without fixed effect)		(with fixed effect)	
variable	coefficient	|t|	coefficient	|t|
Intercept	3239.36	19.92	2319.14	7.61
Predicted Prenatal Care Delay	-1.42	1.78	-1.41	1.90
Predicted Prenatal Care Visits	19.04	2.00	11.82	1.17
Predicted Prenatal Care Interaction	-1135.78	1.54	-518.46	0.69
Mother's Education < 7	3.32	0.13	18.61	0.74
7 - 11	-20.77	2.20	-23.25	2.53
13 - 15	22.94	2.54	17.29	1.96
> 15	-1.03	0.08	0.35	0.03
value is missing	7.68	0.23	-6.68	0.21
Father's Education missing	-47.53	6.14	-46.17	6.30
Narcotics	-319.57	11.68	-305.82	12.17
Alcohol	16.57	0.44	17.76	0.50
Smoking	-108.72	8.36	-109.05	8.88
Other Drugs	-84.67	3.38	-83.48	3.54
Early Miscarriages	-42.86	4.27	-39.54	4.16
Late Miscarriages	-145.40	8.54	-147.61	9.17
Male sex	113.35	19.77	113.30	20.93
Single mother	-19.44	2.06	-17.34	1.92
Plurality	-925.86	30.76	-928.91	32.65
Private Service	32.54	4.57	33.87	5.01
Foreign Born	47.52	6.63	54.62	7.64
value is missing	-260.97	3.13	-246.45	3.13
F value / adj-R^2	77.97	.0504	83.09	.0565
Cohort	-	-	27.46	3.28
Cohort squared	-	-	-0.20	2.89

F value for the fixed effect variables 12.2724 (p=0.0001)

Wu Exogeneity Test	F value	(p value)	F value	(p value)
Prenatal Care (group)	5.0265	(0.0019)	6.5395	(0.0003)

Birthweight Production Equation - 2SLS (Blacks)

variable	coefficient (without fixed effect)	|t| (without fixed effect)	coefficient (with fixed effect)	|t| (with fixed effect)
Intercept	3055.24	29.90	2272.36	7.75
Predicted Prenatal Care Delay	-0.42	0.97	-1.04	2.06
Predicted Prenatal Care Visits	10.42	1.46	7.26	0.96
Predicted Prenatal Care Interaction	-	-	-	-
Mother's Education < 7	0.70	0.03	19.00	0.76
7 - 11	-26.97	3.41	-26.23	3.27
13 - 15	19.70	2.41	15.47	1.86
> 15	-7.77	0.67	-2.82	0.24
value is missing	-32.16	1.72	-24.17	1.28
Father's Education missing	-50.10	7.14	-47.07	6.61
Narcotics	-312.92	12.70	-306.41	12.35
Alcohol	16.48	0.47	17.86	0.51
Smoking	-109.57	9.09	-109.31	9.02
Other Drugs	-84.84	3.65	-83.51	3.58
Early Miscarriages	-41.07	4.44	-38.61	4.16
Late Miscarriages	-154.67	10.47	-151.57	10.21
Male sex	113.30	21.28	113.28	21.19
Single mother	-14.94	1.80	-15.09	1.81
Plurality	-934.93	34.12	-932.62	33.81
Private Service	33.27	5.05	34.02	5.10
Foreign Born	52.17	8.65	57.06	9.29
value is missing	-236.13	3.11	-235.69	3.09
F value / adj-R^2	93.14	.0580	87.66	.0579
Cohort	-	-	26.50	3.25
Cohort squared	-	-	-0.19	2.84

F value for the fixed effect variables 14.3945 (p=0.0001)

Wu Exogeneity Test	F value	(p value)	F value	(p value)
Prenatal Care (group)	6.1470	(0.0021)	9.6743	(0.0001)

Birthweight Production Equation - 2SLS (Blacks)

variable	(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept	3318.81	17.39	2445.20	7.51
Predicted Prenatal Care Delay	-2.06	2.20	-2.05	2.59
Predicted Prenatal Care Visits	31.89	2.87	19.55	1.81
Predicted Prenatal Care Interaction	-2101.17	2.43	-1144.92	1.43
Mother's Education < 7	5.73	0.19	25.81	0.96
7 - 11	-19.10	1.73	-23.82	2.42
13 - 15	26.29	2.48	18.45	1.95
> 15	5.15	0.33	4.29	0.32
value is missing	34.55	0.88	10.89	0.32
Father's Education missing	-48.91	5.38	-47.45	6.05
Narcotics	-	-	-	-
Alcohol	-	-	-	-
Smoking	-	-	-	-
Other Drugs	-	-	-	-
Early Miscarriages	-49.49	4.20	-45.18	4.45
Late Miscarriages	-148.39	7.43	-152.03	8.83
Male sex	113.87	16.91	113.78	19.65
Single mother	-25.97	2.35	-21.77	2.25
Plurality	-923.40	26.13	-927.17	30.46
Private Service	36.70	4.40	37.59	5.20
Foreign Born	53.33	6.35	62.84	8.24
value is missing	-266.62	2.73	-247.23	2.93
F value / adj-R^2	57.60	.0334	73.64	.0451
Cohort	-	-	25.17	2.81
Cohort squared	-	-	-0.18	2.35

F value for the fixed effect variables 13.8771 (p=0.0001)

Wu Exogeneity Test	F value	(p value)	F value	(p value)
Prenatal Care (group)	8.3724	(0.0001)	13.7335	(0.0001)

Birthweight Production Equation - 2SLS (Blacks)

variable	(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept	2977.13	29.01	2342.25	7.93
Predicted Prenatal Care Delay	-0.20	0.47	-1.23	2.43
Predicted Prenatal Care Visits	16.03	2.24	9.48	1.25
Predicted Prenatal Care Interaction	-	-	-	-
Mother's Education < 7	0.89	0.04	26.72	1.07
7 - 11	-30.61	3.85	-30.41	3.76
13 - 15	20.30	2.47	14.41	1.72
> 15	-7.31	0.63	2.71	0.23
value is missing	-39.24	2.09	-27.75	1.45
Father's Education missing	-53.71	7.62	-49.44	6.89
Narcotics	-	-	-	-
Alcohol	-	-	-	-
Smoking	-	-	-	-
Other Drugs	-	-	-	-
Early Miscarriages	-46.24	4.98	-43.15	4.62
Late Miscarriages	-165.69	11.17	-160.81	10.76
Male sex	113.78	21.27	113.72	21.13
Single mother	-17.67	2.11	-16.81	2.00
Plurality	-940.25	34.14	-935.38	33.67
Private Service	38.12	5.76	37.93	5.65
Foreign Born	62.07	10.30	68.28	11.12
value is missing	-220.38	2.89	-223.40	2.91
F value / adj-R^2	94.07	.0518	87.91	.0518
Cohort	-	-	23.01	2.81
Cohort squared	-	-	-0.15	2.25

F value for the fixed effect variables 21.2671 (p=0.0001)

Wu Exogeneity Test	F value	(p value)	F value	(p value)
Prenatal Care (group)	7.8257	(0.0004)	20.3748	(0.0001)

Birthweight Production Equation - OLS (Blacks)

variable	(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept	3181.02	187.66	2650.29	12.86
Prenatal Care Delay	-0.47	8.95	-0.47	9.03
Prenatal Care Visits	-3.22	3.73	-3.10	3.58
Prenatal Care Interaction	-75.44	6.47	-75.26	6.45
Mother's Education < 7	-13.04	0.56	-8.78	0.38
7 - 11	-38.16	5.68	-41.04	5.83
13 - 15	29.11	3.88	29.41	3.91
> 15	0.26	0.02	5.99	0.54
value is missing	-34.50	1.87	-32.65	1.77
Father's Education missing	-58.38	9.04	-58.18	9.01
Narcotics	-305.50	12.45	-300.61	12.22
Alcohol	18.93	0.55	20.25	0.59
Smoking	-112.13	9.36	-112.57	9.39
Other Drugs	-81.71	3.54	-80.36	3.48
Early Miscarriages	-38.73	4.22	-36.85	4.01
Late Miscarriages	-140.46	10.16	-138.43	10.01
Male sex	113.53	21.45	113.52	21.45
Single mother	-23.33	3.24	-27.01	3.68
Plurality	-910.57	35.32	-909.13	35.26
Private Service	26.25	4.06	29.04	4.46
Foreign Born	51.41	8.58	54.26	8.96
value is missing	-260.28	3.48	-258.28	3.46
F value / adj-R^2	94.230	.0597	89.403	.0599
Cohort	-	-	16.06	2.17
Cohort squared	-	-	-0.12	1.92

F value for the fixed effect variables 6.9626 (p=0.0009)

Birthweight Production Equation - OLS (Blacks)

	(without fixed effect)		(with fixed effect)	
variable	coefficient	|t|	coefficient	|t|
Intercept	3174.09	187.55	2650.06	11.85
Prenatal Care Delay	-0.42	8.13	-0.42	8.21
Prenatal Care Visits	-4.18	4.90	-4.06	4.75
Prenatal Care Interaction	-	-	-	-
Mother's Education < 7	-13.05	0.56	-8.78	0.38
7 - 11	-38.51	5.73	-41.53	5.90
13 - 15	28.83	3.84	29.17	3.87
> 15	-0.30	0.03	5.50	0.49
value is missing	-37.08	2.01	-35.22	1.91
Father's Education missing	-58.60	9.07	-58.40	9.04
Narcotics	-306.04	12.47	-301.03	12.23
Alcohol	18.57	0.54	19.95	0.58
Smoking	-112.69	9.40	-113.09	9.43
Other Drugs	-81.44	3.53	-80.08	3.47
Early Miscarriages	-38.60	4.21	-36.69	3.99
Late Miscarriages	-140.83	10.18	-138.78	10.03
Male sex	113.61	21.45	113.60	21.45
Single mother	-22.88	3.18	-26.64	3.63
Plurality	-910.76	35.31	-909.30	35.25
Private Service	26.40	4.08	29.21	4.49
Foreign Born	51.67	8.62	54.57	9.01
value is missing	-259.21	3.47	-257.20	3.44
F value / adj-R^2	95.740	.0589	90.694	.0591
Cohort	-	-	15.81	2.14
Cohort squared	-	-	-0.12	1.88

F value for the fixed effect variables 7.0565 (p=0.0009)

Birthweight Production Equation - OLS (Blacks)

	(without fixed effect)		(with fixed effect)	
variable	coefficient	|t|	coefficient	|t|
Intercept	3170.50	186.79	2779.19	12.41
Prenatal Care Delay	-0.49	9.32	-0.50	9.47
Prenatal Care Visits	-2.54	2.93	-2.45	2.83
Prenatal Care Interaction	-77.04	6.58	-76.64	6.55
Mother's Education < 7	-11.82	0.51	-6.94	0.30
7 - 11	-42.03	6.24	-48.33	6.86
13 - 15	29.81	3.96	31.12	4.12
> 15	0.21	0.02	7.82	0.70
value is missing	-40.76	2.21	-38.40	2.08
Father's Education missing	-63.14	9.76	-62.86	9.72
Narcotics	-	-	-	-
Alcohol	-	-	-	-
Smoking	-	-	-	-
Other Drugs	-	-	-	-
Early Miscarriages	-43.70	4.75	-41.06	4.46
Late Miscarriages	-148.13	10.69	-145.42	10.48
Male sex	113.98	21.47	113.97	21.47
Single mother	-25.08	3.48	-31.12	4.23
Plurality	-909.94	35.18	-907.83	35.10
Private Service	29.66	4.58	33.09	5.08
Foreign Born	61.12	10.23	65.08	10.79
value is missing	-251.41	3.35	-249.20	3.32
F value / adj-R^2	95.696	.0538	90.458	.0542
Cohort	-	-	10.63	1.43
Cohort squared	-	-	-0.07	1.06

F value for the fixed effect variables 11.2967 (p=0.0001)

Birthweight Production Equation - OLS (Blacks)

variable	(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept	3163.78	186.67	2779.49	12.40
Prenatal Care Delay	-0.44	8.48	-0.45	8.64
Prenatal Care Visits	-3.51	4.11	-3.42	4.00
Prenatal Care Interaction	-	-	-	-
Mother's Education < 7	-11.83	0.51	-6.93	0.30
7 - 11	-42.41	6.30	-48.85	6.94
13 - 15	29.53	3.92	30.88	4.09
> 15	-0.36	0.03	7.32	0.65
value is missing	-43.40	2.35	-41.02	2.22
Father's Education missing	-63.38	9.80	-63.10	9.75
Narcotics	-	-	-	-
Alcohol	-	-	-	-
Smoking	-	-	-	-
Other Drugs	-	-	-	-
Early Miscarriages	-43.54	4.74	-40.91	4.44
Late Miscarriages	-148.53	10.71	-145.79	10.51
Male sex	114.06	21.47	114.05	21.47
Single mother	-24.62	3.41	-30.76	4.18
Plurality	-910.12	35.18	-907.98	35.10
Private Service	29.82	4.60	33.28	5.10
Foreign Born	61.43	10.28	65.44	10.84
value is missing	-250.26	3.34	-248.04	3.31
F value / adj-R^2	97.419	.0530	91.915	.0534
Cohort	-	-	10.36	1.40
Cohort squared	-	-	-0.06	1.02

F value for the fixed effect variables 11.5128 (p=0.0001)

Prenatal Care Delay Equation (Hispanics)

variable	(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept	142.89	35.81	-37.60	1.27
Mother's Education < 7	9.05	5.22	9.20	5.31
7 - 11	4.30	4.95	4.05	4.64
13 - 15	-7.53	6.69	-7.86	7.00
> 15	-7.20	3.93	-5.02	2.73
value is missing	-4.61	1.89	-4.29	1.76
Father's Education < 7	4.70	2.39	5.14	2.62
7 - 11	5.36	5.60	5.30	5.54
13 - 15	-5.41	4.19	-5.49	4.25
> 15	-1.95	1.04	-1.01	0.54
value is missing	14.96	14.60	15.11	14.77
Self-pay	9.55	10.02	9.20	9.65
Medicaid	6.78	7.74	6.06	6.90
value is missing	15.12	7.21	14.70	7.02
Prenatal care clinics	-1.80	5.09	-1.76	4.99
Family planning clinics	1.40	5.09	1.36	4.97
Unemployment rate	-5.21	11.61	-5.25	11.70
Poverty rate	0.50	15.41	0.47	14.51
Drug deaths	0.19	3.86	0.21	4.22
Early Miscarriages	-7.24	5.92	-6.70	5.48
Late Miscarriages	-9.55	4.56	-9.22	4.40
Teenage mother	8.36	10.59	3.29	2.90
Single mother	11.13	13.98	10.98	13.78
Plurality	-6.12	1.80	-5.47	1.61
Foreign Born	8.04	10.41	9.19	11.81
value is missing	0.69	0.04	0.98	0.06
Black	-1.04	1.10	-0.99	1.05
F value / adj-R^2	124.61	.0949	122.26	.0976
Cohort	-	-	5.31	5.35
Cohort squared	-	-	-0.04	4.31

F value for the fixed effect variables 69.1834 (p=0.0001)

Prenatal Care Visits Equation (Hispanics)

variable	(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept	8.57	36.76	22.14	12.80
Mother's Education < 7	-0.39	3.82	-0.40	4.00
7 - 11	-0.32	6.23	-0.31	6.10
13 - 15	0.33	5.05	0.35	5.39
> 15	0.04	0.37	-0.08	0.76
value is missing	0.33	2.30	0.31	2.15
Father's Education < 7	0.21	1.80	0.19	1.61
7 - 11	-0.30	5.29	-0.29	5.23
13 - 15	0.22	2.92	0.23	2.99
> 15	-0.01	0.08	-0.06	0.57
value is missing	-0.82	13.65	-0.83	13.81
Self-pay	0.05	0.91	0.07	1.17
Medicaid	-0.05	0.94	-0.01	0.01
value is missing	-0.57	4.65	-0.54	4.42
Prenatal care clinics	0.09	4.52	0.09	4.41
Family planning clinics	-0.06	3.67	-0.06	3.53
Unemployment rate	0.06	2.12	0.06	2.13
Poverty rate	-0.04	18.58	-0.03	17.58
Drug deaths	-0.01	3.28	-0.01	3.79
Early Miscarriages	0.48	6.74	0.45	6.34
Late Miscarriages	0.97	7.90	0.95	7.75
Teenage mother	-0.26	5.74	-0.04	0.60
Single mother	-0.45	9.64	-0.45	9.56
Plurality	1.54	7.74	1.51	7.58
Foreign Born	-0.17	3.74	-0.24	5.19
value is missing	-0.26	0.27	-0.29	0.30
Black	0.14	2.60	0.14	2.59
F value / adj-R^2	94.29	.0735	93.58	.0764
Cohort	-	-	-0.42	7.16
Cohort squared	-	-	0.003	6.18

F value for the fixed effect variables 73.9599 (p=0.0001)

Birthweight Production Equation - 2SLS (Hispanics)

	(without fixed effect)		(with fixed effect)	
variable	coefficient	|t|	coefficient	|t|
Intercept	3174.43	20.46	1938.43	5.88
Predicted Prenatal Care Delay	-1.49	2.26	-1.60	2.35
Predicted Prenatal Care Visits	27.97	3.16	32.45	3.44
Predicted Prenatal Care Interaction	-477.91	0.92	-972.88	1.61
Mother's Education < 7	1.55	0.11	-0.71	0.05
7 - 11	-6.04	0.84	2.94	0.39
13 - 15	1.49	0.15	4.58	0.43
> 15	-9.88	0.67	-3.55	0.23
value is missing	-28.87	1.43	-30.59	1.45
Father's Education missing	-15.61	1.88	-16.07	1.83
Narcotics	-360.73	13.22	-362.03	12.74
Alcohol	-0.15	0.01	-0.31	0.01
Smoking	-95.06	6.57	-96.77	6.43
Other Drugs	-50.22	1.92	-49.47	1.82
Early Miscarriages	-39.68	3.81	-37.03	3.41
Late Miscarriages	-157.60	6.71	-142.55	5.51
Male sex	96.62	18.11	96.69	17.40
Single mother	-12.68	1.63	-15.17	1.81
Plurality	-975.35	29.98	-965.73	28.12
Private Service	31.55	4.36	33.91	4.48
Foreign Born	59.75	8.49	56.63	6.45
value is missing	-25.35	0.17	40.17	0.25
Black	5.38	0.63	8.14	0.90
F value / adj-R^2	76.66	.0547	67.19	.0509
Cohort	-	-	42.15	5.14
Cohort squared	-	-	-0.35	5.18

F value for the fixed effect variables 13.4253 (p=0.0001)

Wu Exogeneity Test	F value	(p value)	F value	(p value)
Prenatal Care (group)	27.5015	(0.0001)	22.6305	(0.0001)

Birthweight Production Equation - 2SLS (Hispanics)

variable	coefficient (without fixed effect)	|t| (without fixed effect)	coefficient (with fixed effect)	|t| (with fixed effect)
Intercept	3085.08	25.72	1706.39	6.05
Predicted Prenatal Care Delay	-1.07	2.26	-0.91	1.81
Predicted Prenatal Care Visits	26.36	3.07	28.60	3.30
Predicted Prenatal Care Interaction	-	-	-	-
Mother's Education < 7	4.55	0.34	6.73	0.49
7 - 11	-6.63	0.93	-4.81	0.67
13 - 15	-1.62	0.18	-2.83	0.31
> 15	-9.47	0.65	-1.96	0.13
value is missing	-25.74	1.31	-24.32	1.24
Father's Education missing	-17.11	2.12	-17.24	2.07
Narcotics	-361.25	13.37	-362.24	13.40
Alcohol	0.51	0.02	0.70	0.02
Smoking	-95.01	6.63	-96.60	6.74
Other Drugs	-50.15	1.94	-49.41	1.91
Early Miscarriages	-41.17	4.04	-40.25	3.96
Late Miscarriages	-171.56	9.67	-171.42	9.66
Male sex	96.68	18.28	96.67	18.28
Single mother	-11.34	1.50	-11.48	1.50
Plurality	-987.15	33.32	-988.93	33.36
Private Service	30.71	4.32	32.12	4.51
Foreign Born	61.99	9.47	64.18	9.10
value is missing	-84.04	0.63	-79.66	0.59
Black	1.94	0.26	1.29	0.17
F value / adj-R^2	80.04	.0557	76.18	.0558
Cohort	-	-	43.83	5.66
Cohort squared	-	-	-0.35	5.56

F value for the fixed effect variables 16.3686 (p=0.0001)

Wu Exogeneity Test	F value	(p value)	F value	(p value)
Prenatal Care (group)	41.4691	(0.0001)	33.4765	(0.0001)

Birthweight Production Equation - 2SLS (Hispanics)

variable	(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept	3181.67	20.32	1974.65	5.99
Predicted Prenatal Care Delay	-1.57	2.37	-1.68	2.47
Predicted Prenatal Care Visits	29.17	3.27	32.57	3.45
Predicted Prenatal Care Interaction	-576.83	1.10	-936.16	1.55
Mother's Education < 7	1.31	0.09	0.54	0.04
7 - 11	-9.03	1.24	-6.78	0.89
13 - 15	1.26	0.13	2.90	0.27
> 15	-8.62	0.58	-2.12	0.14
value is missing	-31.99	1.57	-32.94	1.57
Father's Education missing	-19.65	2.35	-19.43	2.22
Narcotics	-	-	-	-
Alcohol	-	-	-	-
Smoking	-	-	-	-
Other Drugs	-	-	-	-
Early Miscarriages	-42.34	4.03	-40.24	3.70
Late Miscarriages	-158.75	6.70	-147.85	5.71
Male sex	97.62	18.11	97.62	17.56
Single mother	-17.50	2.23	-19.09	2.28
Plurality	-974.53	29.67	-967.40	28.16
Private Service	31.79	4.36	33.91	4.48
Foreign Born	64.76	9.13	64.12	7.31
value is missing	-23.09	0.15	25.19	0.16
Black	5.39	0.63	7.33	0.81
F value / adj-R^2	76.70	.0488	67.91	.0461
Cohort	-	-	40.50	4.94
Cohort squared	-	-	-0.33	4.92

F value for the fixed effect variables 12.1860 (p=0.0001)

Wu Exogeneity Test	F value	(p value)	F value	(p value)
Prenatal Care (group)	28.1081	(0.0001)	39.7750	(0.0001)

Birthweight Production Equation - 2SLS (Hispanics)

variable	(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept	3073.89	25.54	1751.38	6.18
Predicted Prenatal Care Delay	-1.07	2.25	-1.02	2.02
Predicted Prenatal Care Visits	27.22	3.16	28.85	3.31
Predicted Prenatal Care Interaction	-	-	-	-
Mother's Education < 7	4.93	0.36	7.70	0.56
7 - 11	-9.74	1.36	-8.56	1.19
13 - 15	-2.49	0.27	4.23	0.46
> 15	-8.13	0.56	-0.59	0.04
value is missing	-28.20	1.43	-26.97	1.36
Father's Education missing	-21.47	2.65	-20.55	2.46
Narcotics	-	-	-	-
Alcohol	-	-	-	-
Smoking	-	-	-	-
Other Drugs	-	-	-	-
Early Miscarriages	-44.13	4.32	-43.33	4.24
Late Miscarriages	-175.61	9.86	-175.62	9.84
Male sex	97.62	18.39	97.61	18.36
Single mother	-15.89	2.10	-15.53	2.02
Plurality	-988.77	33.25	-989.72	33.20
Private Service	30.79	4.32	32.20	4.50
Foreign Born	67.47	10.29	71.39	10.09
value is missing	-93.91	0.70	-90.09	0.67
Black	1.22	0.16	0.74	0.10
F value / adj-R^2	81.67	.0502	76.49	.0501
Cohort	-	-	42.12	5.41
Cohort squared	-	-	-0.34	5.25

F value for the fixed effect variables 15.7701 (p=0.0001)

Wu Exogeneity Test	F value	(p value)	F value	(p value)
Prenatal Care (group)	42.2613	(0.0001)	60.0518	(0.0001)

Birthweight Production Equation - OLS (Hispanics)

variable	(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept	3222.80	194.45	2439.19	11.37
Prenatal Care Delay	-0.39	7.80	-0.39	7.70
Prenatal Care Visits	-1.57	1.88	-1.53	1.82
Prenatal Care Interaction	-51.63	4.46	-52.05	4.50
Mother's Education < 7	-24.90	2.00	-20.75	1.67
7 - 11	-35.04	5.77	-27.54	4.37
13 - 15	19.75	2.37	17.17	2.05
> 15	8.29	0.62	5.69	0.42
value is missing	-20.72	1.10	-19.83	1.05
Father's Education missing	-46.47	6.66	-46.96	6.73
Narcotics	-352.46	13.56	-356.62	13.71
Alcohol	-1.80	0.06	-1.56	0.06
Smoking	-100.57	7.31	-101.41	7.37
Other Drugs	-46.48	1.87	-42.93	1.85
Early Miscarriages	-19.75	2.08	-21.56	2.27
Late Miscarriages	-134.00	8.24	-135.23	8.32
Male sex	96.72	19.03	96.79	19.05
Single mother	-42.79	7.09	-38.77	6.36
Plurality	-935.72	35.43	-938.15	35.52
Private Service	32.22	4.73	30.55	4.46
Foreign Born	57.67	9.86	53.66	8.91
value is missing	-86.37	0.67	-82.20	0.64
Black	4.70	0.64	3.30	0.45
F value / adj-R^2	84.349	.0591	80.490	.0596
Cohort	-	-	27.72	3.90
Cohort squared	-	-	-0.24	4.13

F value for the fixed effect variables 12.2360 (p=0.0001)

Birthweight Production Equation - OLS (Hispanics)

variable	(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept	3217.73	194.56	2435.06	11.34
Prenatal Care Delay	-0.36	7.23	-0.35	7.12
Prenatal Care Visits	-2.14	2.58	-2.10	2.53
Prenatal Care Interaction	-	-	-	-
Mother's Education < 7	-24.68	2.98	-20.56	1.65
7 - 11	-35.26	5.80	-27.83	4.42
13 - 15	19.50	2.34	16.85	2.02
> 15	8.35	0.62	5.82	0.43
value is missing	-20.34	1.08	-19.45	1.03
Father's Education missing	-46.76	6.70	-47.24	6.77
Narcotics	-352.81	13.57	-356.93	13.72
Alcohol	-2.66	0.09	-2.43	0.09
Smoking	-100.81	7.33	-101.65	7.39
Other Drugs	-46.41	1.87	-45.85	1.85
Early Miscarriages	-19.78	2.09	-21.57	2.27
Late Miscarriages	-135.23	8.32	-136.44	8.39
Male sex	96.86	19.06	96.93	19.07
Single mother	-42.75	7.08	-38.77	6.36
Plurality	-936.45	35.45	-938.85	35.54
Private Service	31.84	4.68	30.20	4.40
Foreign Born	57.95	9.91	54.00	8.96
value is missing	-92.75	0.72	-88.65	0.69
Black	4.31	0.59	2.93	0.40
F value / adj-R^2	86.209	.0588	82.129	.0592
Cohort	-	-	27.66	3.90
Cohort squared	-	-	-0.24	4.12

F value for the fixed effect variables 12.0682 (p=0.0001)

Birthweight Production Equation - OLS (Hispanics)

variable		(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept		3214.95	193.64	2487.25	11.56
Prenatal Care Delay		-0.40	7.86	-0.39	7.77
Prenatal Care Visits		-1.10	1.31	-1.05	1.25
Prenatal Care Interaction		-52.82	4.55	-53.18	4.59
Mother's Education	< 7	-24.97	2.00	-21.31	1.71
	7 - 11	-38.59	6.34	-32.20	5.11
	13 - 15	19.18	2.30	16.83	2.01
	> 15	9.87	0.73	8.00	0.59
value is missing		-23.11	1.22	-22.31	1.18
Father's Education missing		-51.09	7.31	-51.51	7.37
Narcotics		-	-	-	-
Alcohol		-	-	-	-
Smoking		-	-	-	-
Other Drugs		-	-	-	-
Early Miscarriages		-22.48	2.37	-23.98	2.52
Late Miscarriages		-137.58	8.44	-138.60	8.50
Male sex		97.66	19.16	97.73	19.18
Single mother		-47.71	7.89	-44.32	7.26
Plurality		-936.52	35.36	-938.55	35.43
Private Service		31.81	4.66	30.55	4.44
Foreign Born		63.16	10.79	60.01	9.95
value is missing		-96.03	0.74	-92.43	0.07
Black		3.98	0.54	2.78	0.38
F value / adj-R^2		85.551	.0535	80.967	.0538
Cohort		-	-	25.54	3.59
Cohort squared		-	-	-0.22	3.77

F value for the fixed effect variables 9.4454 (p=0.0001)

Birthweight Production Equation - OLS (Hispanics)

variable	(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept	3209.73	193.75	2483.16	11.54
Prenatal Care Delay	-0.36	7.27	-0.36	7.18
Prenatal Care Visits	-1.68	2.02	-1.63	1.96
Prenatal Care Interaction	-	-	-	-
Mother's Education < 7	-24.75	1.98	-21.11	1.69
7 - 11	-38.82	6.38	-35.51	5.15
13 - 15	18.91	2.26	16.58	1.98
> 15	9.94	0.74	8.14	0.60
value is missing	-22.73	1.20	-21.93	1.16
Father's Education missing	-51.39	7.35	-51.81	7.41
Narcotics	-	-	-	-
Alcohol	-	-	-	-
Smoking	-	-	-	-
Other Drugs	-	-	-	-
Early Miscarriages	-22.52	2.37	-23.99	2.52
Late Miscarriages	-138.84	8.51	-139.85	8.58
Male sex	97.81	19.19	97.87	19.20
Single mother	-47.68	7.89	-44.33	7.26
Plurality	-937.27	35.38	-936.27	35.45
Private Service	31.42	4.60	30.19	4.39
Foreign Born	63.46	10.84	60.37	10.01
value is missing	-102.61	0.79	-99.07	0.77
Black	3.59	0.49	2.40	0.33
F value / adj-R^2	87.674	.0531	82.802	.0534
Cohort	-	-	25.48	3.58
Cohort squared	-	-	-0.22	3.76

F value for the fixed effect variables 9.3003 (p=0.0001)

APPENDIX D COEFFICIENTS - Prenatal Care Only Sample

Prenatal Care Delay Equation (Whites)

variable		(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept		78.92	42.34	161.76	9.73
Mother's Education	< 7	12.12	4.84	11.86	4.74
	7 - 11	7.26	8.06	6.33	7.01
	13 - 15	-2.02	3.31	-1.75	2.86
	> 15	-1.74	2.74	-0.50	0.78
value is missing		-12.82	9.75	-11.40	8.66
Father's Education	< 7	-5.53	2.24	-5.33	2.16
	7 - 11	2.55	2.56	2.29	2.30
	13 - 15	-3.15	4.89	-2.82	4.39
	> 15	-1.13	1.73	-0.75	1.14
value is missing		13.22	12.99	13.18	12.98
Self-pay		14.33	22.61	13.68	21.52
Medicaid		21.01	25.94	20.85	25.74
value is missing		10.42	7.49	10.37	7.47
Prenatal care clinics		-1.04	4.01	-1.01	3.89
Family planning clinics		0.89	3.52	0.94	3.74
Unemployment rate		-0.73	3.47	-0.78	3.69
Poverty rate		0.29	11.01	0.26	10.05
Drug deaths		0.17	4.21	0.19	4.65
Early Miscarriages		1.06	1.73	1.51	2.47
Late Miscarriages		-2.25	1.43	-1.98	1.26
Teenage mother		17.77	25.26	10.84	12.47
Single mother		19.11	26.15	18.82	25.75
Plurality		-5.15	2.94	-4.52	2.58
Foreign Born		8.71	19.11	8.67	19.05
value is missing		3.45	0.48	-4.31	0.60
F value / adj-R^2		273.75	.1645	265.94	.1676
Cohort		-	-	-3.49	6.03
Cohort squared		-	-	0.04	7.06

F value for the fixed effect variables 98.3878 (p=0.0001)

Prenatal Care Visits Equation (Whites)

variable		(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept		10.54	75.98	12.55	10.17
Mother's Education	< 7	-0.60	3.21	-0.60	3.22
	7 - 11	-0.34	5.03	-0.27	4.02
	13 - 15	0.18	3.97	0.15	3.36
	> 15	0.30	6.28	0.17	3.48
value is missing		0.97	9.94	0.83	8.44
Father's Education	< 7	-0.01	0.05	-0.02	0.10
	7 - 11	-0.13	1.76	-0.10	1.36
	13 - 15	0.10	2.07	0.07	1.37
	> 15	0.32	6.60	0.27	5.61
value is missing		-0.48	6.29	-0.49	6.43
Self-pay		0.10	2.16	0.14	2.89
Medicaid		-0.54	8.99	-0.49	8.20
value is missing		-0.34	3.31	-0.34	3.31
Prenatal care clinics		0.03	1.30	0.02	1.06
Family planning clinics		0.01	0.42	0.01	0.04
Unemployment rate		-0.18	11.28	-0.19	11.81
Poverty rate		-0.01	6.14	-0.01	4.70
Drug deaths		-0.01	0.51	-0.01	1.40
Early Miscarriages		0.16	3.63	0.12	2.61
Late Miscarriages		0.61	5.24	0.58	4.96
Teenage mother		-0.50	9.56	0.05	0.71
Single mother		-0.36	6.57	-0.35	6.53
Plurality		2.43	18.65	2.37	18.20
Foreign Born		-0.32	9.42	-0.32	9.53
value is missing		-0.69	1.29	-0.62	1.16
F value / adj-R^2		106.66	.0713	111.13	.0776
Cohort		-	-	-0.006	0.14
Cohort squared		-	-	-0.001	1.45

F value for the fixed effect variables 182.3115 (p=0.0001)

Birthweight Production Equation - 2SLS (Whites)

variable	(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept	3245.08	24.41	2860.92	11.13
Predicted Prenatal Care Delay	-1.32	1.65	-2.20	2.70
Predicted Prenatal Care Visits	24.78	2.20	31.86	2.70
Predicted Prenatal Care Interaction	-838.45	1.42	-1045.54	1.79
Mother's Education < 7	3.59	0.12	7.23	0.24
7 - 11	13.64	1.10	14.71	1.15
13 - 15	19.32	2.52	19.85	2.53
> 15	-22.37	2.41	-13.08	1.41
value is missing	-3.58	0.20	-5.61	0.30
Father's Education missing	-27.07	2.02	-14.60	1.02
Narcotics	-181.78	5.35	-177.48	5.06
Alcohol	229.94	9.17	229.19	8.86
Smoking	-48.10	3.17	-47.36	3.03
Other Drugs	-33.83	1.85	-29.37	1.55
Early Miscarriages	-10.13	1.12	-5.25	0.57
Late Miscarriages	-40.72	1.97	-42.36	1.99
Male sex	122.64	25.36	122.63	24.59
Single mother	-40.24	3.46	-25.55	2.03
Plurality	-878.83	27.18	-884.50	26.94
Private Service	46.56	5.94	46.39	5.72
Foreign Born	-4.99	0.78	3.20	0.45
value is missing	-190.24	2.07	-191.37	2.02
F value / adj-R^2	77.88	.0477	69.84	.0454
Cohort	-	-	10.54	1.39
Cohort squared	-	-	-0.05	0.78

F value for the fixed effect variables 15.4330 (p=0.0001)

Wu Exogeneity Test	F value	(p value)	F value	(p value)
Prenatal Care (group)	8.7152	(0.0001)	12.1318	(0.0001)

Birthweight Production Equation - 2SLS (Whites)

variable	(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept	3124.16	31.88	2806.41	11.70
Predicted Prenatal Care Delay	-0.30	0.89	-0.91	2.55
Predicted Prenatal Care Visits	15.09	1.76	18.85	2.16
Predicted Prenatal Care Interaction	-	-	-	-
Mother's Education < 7	-9.31	0.33	-1.00	0.04
7 - 11	6.81	0.62	5.63	0.51
13 - 15	20.47	2.80	21.48	2.93
> 15	-28.73	3.67	-21.21	2.79
value is missing	1.54	0.09	1.31	0.08
Father's Education missing	-30.64	2.42	-19.93	1.51
Narcotics	-181.15	5.55	-176.85	5.37
Alcohol	229.38	9.53	228.35	9.40
Smoking	-48.32	3.32	-47.60	3.24
Other Drugs	-33.96	1.93	-29.72	1.67
Early Miscarriages	-16.19	2.12	-12.84	1.68
Late Miscarriages	-39.37	1.98	-40.23	2.01
Male sex	122.63	26.41	122.62	26.18
Single mother	-41.87	3.77	-28.68	2.45
Plurality	-894.54	30.67	-902.00	30.64
Private Service	46.49	6.18	46.40	6.09
Foreign Born	-4.06	0.66	3.72	0.56
value is missing	-184.94	2.10	-185.40	2.08
F value / adj-R^2	86.93	.0515	81.33	.0511
Cohort	-	-	7.63	1.10
Cohort squared	-	-	-0.03	0.47

F value for the fixed effect variables 15.8695 (p=0.0001)

Wu Exogeneity Test	F value	(p value)	F value	(p value)
Prenatal Care (group)	12.1300	(0.0001)	16.4267	(0.0001)

Birthweight Production Equation - 2SLS (Whites)

variable	(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept	3253.01	24.76	2877.46	11.33
Predicted Prenatal Care Delay	-1.28	1.60	-2.15	2.68
Predicted Prenatal Care Visits	21.16	1.90	29.38	2.52
Predicted Prenatal Care Interaction	-729.11	1.25	-943.39	1.63
Mother's Education < 7	-1.61	0.06	9.95	0.33
7 - 11	13.46	1.10	14.87	1.18
13 - 15	20.64	2.72	20.91	2.70
> 15	-22.85	2.49	-13.78	1.50
value is missing	0.98	0.05	-2.03	0.11
Father's Education missing	-30.66	2.31	-17.48	1.23
Narcotics	-	-	-	-
Alcohol	-	-	-	-
Smoking	-	-	-	-
Other Drugs	-	-	-	-
Early Miscarriages	-11.15	1.25	-6.21	0.68
Late Miscarriages	-40.51	1.98	-42.68	2.03
Male sex	123.04	25.74	123.04	24.97
Single mother	-42.21	3.67	-26.93	2.17
Plurality	-875.48	27.40	-883.40	27.23
Private Service	49.57	6.42	49.29	6.16
Foreign Born	-5.12	0.81	3.50	0.50
value is missing	-195.26	2.15	-195.77	2.09
F value / adj-R^2	86.47	.0468	77.16	.0447
Cohort	-	-	9.89	1.32
Cohort squared	-	-	-0.05	0.69

F value for the fixed effect variables 16.2837 (p=0.0001)

Wu Exogeneity Test	F value	(p value)	F value	(p value)
Prenatal Care (group)	7.7929	(0.0001)	23.9692	(0.0001)

Birthweight Production Equation - 2SLS (Whites)

variable	(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept	3147.83	32.18	2828.26	11.80
Predicted Prenatal Care Delay	-0.38	1.10	-0.99	2.78
Predicted Prenatal Care Visits	12.74	1.49	17.64	2.02
Predicted Prenatal Care Interaction	-	-	-	-
Mother's Education < 7	-6.60	0.24	2.52	0.09
7 - 11	7.52	0.68	6.67	0.61
13 - 15	21.64	2.96	22.37	3.06
> 15	-28.38	3.63	-21.12	2.78
value is missing	5.43	0.32	4.22	0.24
Father's Education missing	-33.76	2.67	-22.28	1.69
Narcotics	-	-	-	-
Alcohol	-	-	-	-
Smoking	-	-	-	-
Other Drugs	-	-	-	-
Early Miscarriages	-16.43	2.16	-13.07	1.71
Late Miscarriages	-39.34	1.98	-40.77	2.04
Male sex	123.02	26.53	123.02	26.27
Single mother	-43.63	3.93	-29.75	2.55
Plurality	-889.16	30.53	-899.21	30.55
Private Service	49.51	6.61	49.30	6.48
Foreign Born	-4.30	0.70	3.98	0.60
value is missing	-190.63	2.16	-190.35	2.14
F value / adj-R^2	94.97	.0496	88.06	.0491
Cohort	-	-	7.26	1.05
Cohort squared	-	-	-0.02	0.40

F value for the fixed effect variables 16.6357 (p=0.0001)

Wu Exogeneity Test	F value	(p value)	F value	(p value)
Prenatal Care (group)	11.0131	(0.0001)	33.9210	(0.0001)

Birthweight Production Equation - OLS (Whites)

	(without fixed effect)		(with fixed effect)	
variable	coefficient	|t|	coefficient	|t|
Intercept	3447.30	229.90	3083.17	16.97
Prenatal Care Delay	-0.59	9.99	-0.59	10.01
Prenatal Care Visits	-17.97	23.20	-17.84	22.9
Prenatal Care Interaction	-27.91	2.52	-28.33	2.56
Mother's Education < 7	-32.35	1.20	-32.11	1.19
7 - 11	-10.31	1.04	-11.65	1.15
13 - 15	32.25	4.78	33.45	4.93
> 15	-13.28	1.92	-10.22	1.45
value is missing	31.18	2.00	33.96	2.17
Father's Education missing	-46.03	3.93	-45.73	3.90
Narcotics	-190.25	5.94	-189.97	5.93
Alcohol	228.90	9.70	228.05	9.67
Smoking	-53.10	3.72	-52.86	3.70
Other Drugs	-15.28	0.89	-13.97	0.81
Early Miscarriages	-10.02	1.37	-9.21	1.26
Late Miscarriages	-19.17	1.02	-18.43	0.98
Male sex	123.49	27.14	123.51	27.14
Single mother	-55.66	6.32	-55.21	6.23
Plurality	-814.16	38.68	-813.31	38.63
Private Service	42.69	5.84	43.73	5.94
Foreign Born	-15.31	2.83	-14.84	2.74
value is missing	-211.57	2.45	-211.79	2.46
F value / adj-R^2	105.73	.0631	100.87	.0632
Cohort	-	-	11.68	1.85
Cohort squared	-	-	-0.09	1.67

F value for the fixed effect variables 3.9530 (p=0.0192)

Birthweight Production Equation - OLS (Whites)

variable	(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept	3444.32	230.41	3082.99	16.97
Prenatal Care Delay	-0.55	9.66	-0.55	9.68
Prenatal Care Visits	-18.48	24.72	-18.35	24.49
Prenatal Care Interaction	-	-	-	-
Mother's Education < 7	-32.65	1.22	-32.42	1.21
7 - 11	-10.60	1.07	-11.90	1.18
13 - 15	32.35	4.79	33.52	4.94
> 15	-13.41	1.94	-10.39	1.48
value is missing	31.57	2.02	34.31	2.19
Father's Education missing	-46.25	3.95	-45.96	3.92
Narcotics	-190.37	5.95	-190.11	5.94
Alcohol	228.56	9.69	227.73	9.65
Smoking	-53.05	3.72	-52.82	3.70
Other Drugs	-15.23	0.88	-13.94	0.81
Early Miscarriages	-10.19	1.40	-9.39	1.29
Late Miscarriages	-19.00	1.01	-18.26	0.97
Male sex	123.49	27.14	123.51	27.14
Single mother	-55.74	6.32	-55.28	6.24
Plurality	-814.22	38.68	-813.39	38.63
Private Service	43.15	5.91	44.18	6.01
Foreign Born	-15.35	2.84	-14.88	2.75
value is missing	-211.49	2.45	-211.70	2.46
F value / adj-R^2	108.73	.0630	102.75	.0631
Cohort	-	-	11.60	1.83
Cohort squared	-	-	-0.09	1.66

F value for the fixed effect variables 3.8578 (p=0.0211)

Birthweight Production Equation - OLS (Whites)

variable	(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept	3445.47	229.90	3079.27	16.94
Prenatal Care Delay	-0.60	10.24	-0.60	10.27
Prenatal Care Visits	-17.95	23.18	-17.80	22.92
Prenatal Care Interaction	-27.44	2.47	-27.89	2.51
Mother's Education < 7	-28.52	1.06	-28.41	1.06
7 - 11	-9.31	0.94	-11.04	1.09
13 - 15	32.99	4.88	34.35	5.06
> 15	-13.57	1.96	-10.18	1.45
value is missing	33.80	2.16	36.89	2.35
Father's Education missing	-48.95	4.18	-48.65	4.15
Narcotics	-	-	-	-
Alcohol	-	-	-	-
Smoking	-	-	-	-
Other Drugs	-	-	-	-
Early Miscarriages	-10.41	1.43	-9.45	1.29
Late Miscarriages	-20.23	1.07	-19.39	1.03
Male sex	124.92	27.20	123.94	27.21
Single mother	-57.81	6.56	-57.45	6.49
Plurality	-813.97	38.63	-813.01	38.57
Private Service	45.44	6.23	46.67	6.35
Foreign Born	-15.01	2.78	-14.51	2.68
value is missing	-215.77	2.50	-216.08	2.50
F value / adj-R^2	115.34	.0609	108.42	.0611
Cohort	-	-	11.63	1.84
Cohort squared	-	-	-0.09	1.64

F value for the fixed effect variables 4.4608 (p=0.0116)

Birthweight Production Equation - OLS (Whites)

variable	(without fixed effect) coefficient	(without fixed effect) $\lvert t \rvert$	(with fixed effect) coefficient	(with fixed effect) $\lvert t \rvert$
Intercept	3442.54	230.42	3079.14	16.93
Prenatal Care Delay	-0.56	9.93	-0.57	9.96
Prenatal Care Visits	-18.45	24.68	-18.31	24.43
Prenatal Care Interaction	-	-	-	-
Mother's Education < 7	-28.82	1.07	-28.71	1.07
7 - 11	-9.59	0.97	-11.29	1.12
13 - 15	33.08	4.90	34.43	5.07
> 15	-13.70	1.98	-10.36	1.47
value is missing	34.19	2.19	37.24	2.37
Father's Education missing	-49.17	4.20	-48.88	4.17
Narcotics	-	-	-	-
Alcohol	-	-	-	-
Smoking	-	-	-	-
Other Drugs	-	-	-	-
Early Miscarriages	-10.57	1.45	-9.64	1.32
Late Miscarriages	-20.06	1.06	-19.23	1.02
Male sex	123.91	27.20	123.93	27.21
Single mother	-57.89	6.57	-57.52	6.50
Plurality	-814.03	38.63	-813.08	38.58
Private Service	45.90	6.29	47.12	6.42
Foreign Born	-15.04	2.78	-14.55	2.69
value is missing	-215.68	2.50	-215.98	2.50
F value / adj-R^2	119.09	.0609	111.70	.0610
Cohort	-	-	11.55	1.82
Cohort squared	-	-	-0.09	1.63

F value for the fixed effect variables 4.3589 (p=0.0128)

Prenatal Care Delay Equation (Blacks)

variable		(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept		102.68	32.97	-27.11	1.16
Mother's Education	< 7	14.17	5.46	15.18	5.86
	7 - 11	3.15	4.32	2.43	3.31
	13 - 15	-4.75	6.14	-5.06	6.56
	> 15	-6.47	5.73	-4.17	3.67
value is missing		-1.86	0.95	-1.25	0.64
Father's Education	< 7	3.12	0.83	3.82	1.02
	7 - 11	3.12	2.93	3.19	3.00
	13 - 15	-3.33	3.44	-3.40	3.52
	> 15	-0.97	0.76	-0.08	0.06
value is missing		0.84	1.14	1.04	1.42
Self-pay		12.38	15.40	11.83	14.68
Medicaid		8.86	13.21	7.97	11.81
value is missing		19.17	11.31	18.74	11.08
Prenatal care clinics		-0.80	2.51	-0.81	2.58
Family planning clinics		0.52	1.93	0.53	1.97
Unemployment rate		-0.08	0.23	0.04	0.13
Poverty rate		-0.05	2.14	-0.07	2.86
Drug deaths		-0.02	0.71	-0.02	0.66
Early Miscarriages		-1.83	2.02	-1.16	1.29
Late Miscarriages		-4.72	3.45	-3.93	2.88
Teenage mother		14.53	22.04	7.42	8.00
Single mother		8.97	12.24	7.97	10.86
Plurality		-13.29	5.12	-12.78	4.94
Foreign Born		4.33	6.96	4.80	7.10
value is missing		-6.25	0.80	-6.47	0.84
F value / adj-R^2		100.41	.0778	102.00	.0828
Cohort		-	-	3.44	4.37
Cohort squared		-	-	-0.02	2.89

F value for the fixed effect variables 122.0211 (p=0.0001)

Prenatal Care Visits Equation (Blacks)

variable	(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept	11.58	58.65	25.68	17.31
Mother's Education < 7	-0.30	1.82	-0.38	2.31
7 - 11	-0.19	4.20	-0.18	3.90
13 - 15	0.22	4.50	0.24	4.96
> 15	0.11	1.57	-0.02	0.30
value is missing	0.34	2.76	0.29	2.40
Father's Education < 7	0.05	0.19	0.01	0.04
7 - 11	-0.11	1.58	-0.11	1.64
13 - 15	0.19	3.15	0.20	3.23
> 15	0.12	1.48	0.06	0.80
value is missing	-0.22	4.64	-0.23	4.89
Self-pay	0.03	0.65	0.05	0.89
Medicaid	-0.39	9.26	-0.32	7.49
value is missing	-0.73	6.78	-0.69	6.44
Prenatal care clinics	0.04	2.11	0.04	2.14
Family planning clinics	-0.01	0.86	-0.01	0.83
Unemployment rate	-0.30	13.88	-0.31	14.27
Poverty rate	-0.01	5.61	-0.01	4.91
Drug deaths	0.01	1.97	0.01	1.70
Early Miscarriages	0.13	2.29	0.09	1.58
Late Miscarriages	0.95	10.96	0.90	10.38
Teenage mother	-0.39	9.39	-0.10	1.73
Single mother	-0.17	3.76	-0.13	2.69
Plurality	1.97	11.99	1.94	11.82
Foreign Born	-0.22	5.59	-0.25	6.35
value is missing	-1.32	2.69	-1.31	2.68
F value / adj-R^2	56.38	.0452	59.85	.0503
Cohort	-	-	-0.43	8.55
Cohort squared	-	-	0.003	7.25

F value for the fixed effect variables 120.1482 (p=0.0001)

Birthweight Production Equation - 2SLS (Blacks)

	(without fixed effect)		(with fixed effect)	
variable	coefficient	|t|	coefficient	|t|
Intercept	2897.42	19.95	2405.27	6.67
Predicted Prenatal Care Delay	1.26	1.36	0.94	0.92
Predicted Prenatal Care Visits	-16.51	1.04	-14.59	0.91
Predicted Prenatal Care Interaction	1605.92	1.78	1584.57	1.79
Mother's Education < 7	4.82	0.16	14.13	0.45
7 - 11	-35.34	3.62	-35.60	3.62
13 - 15	23.02	2.28	20.53	1.96
> 15	-9.57	0.65	-6.45	0.44
value is missing	-51.06	1.34	-49.97	1.33
Father's Education missing	-48.29	5.83	-47.35	5.68
Narcotics	-254.66	7.47	-252.24	7.40
Alcohol	10.58	0.23	11.03	0.24
Smoking	-119.51	7.69	-129.12	7.73
Other Drugs	-85.62	2.95	-84.67	2.92
Early Miscarriages	-27.63	2.37	-26.78	2.31
Late Miscarriages	-150.82	7.99	-151.61	7.99
Male sex	115.52	17.60	115.49	17.62
Single mother	-15.73	1.49	-15.01	1.38
Plurality	-886.47	24.31	-892.29	23.94
Private Service	26.40	3.34	27.45	3.42
Foreign Born	45.78	6.01	49.85	6.02
value is missing	-90.08	0.91	-88.99	0.90
F value / adj-R^2	50.37	.0365	47.85	.0367
Cohort	-	-	15.42	1.49
Cohort squared	-	-	-0.11	1.23

F value for the fixed effect variables 1.9681 (p=0.1397)

Wu Exogeneity Test	F value	(p value)	F value	(p value)
Prenatal Care (group)	3.9009	(0.0086)	4.0582	(0.0070)

Birthweight Production Equation - 2SLS (Blacks)

variable	(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept	3054.85	31.93	2415.14	8.03
Predicted Prenatal Care Delay	-0.16	0.40	-0.49	0.92
Predicted Prenatal Care Visits	6.60	0.86	8.43	1.05
Predicted Prenatal Care Interaction	-	-	-	-
Mother's Education < 7	2.24	0.09	12.73	0.49
7 - 11	-29.74	3.88	-29.78	3.84
13 - 15	27.03	3.31	24.15	2.81
> 15	-0.83	0.07	2.90	0.25
value is missing	1.30	0.07	1.93	0.10
Father's Education missing	-48.46	7.05	-47.42	6.82
Narcotics	-254.32	8.99	-251.77	8.86
Alcohol	10.52	0.28	11.03	0.29
Smoking	-120.12	9.31	-120.72	9.31
Other Drugs	-85.51	3.55	-84.58	3.50
Early Miscarriages	-32.61	3.47	-31.50	3.35
Late Miscarriages	-146.26	9.42	-147.04	9.38
Male sex	115.59	21.23	115.56	21.15
Single mother	-18.29	2.10	-17.56	1.95
Plurality	-896.75	30.02	-902.91	29.43
Private Service	25.75	3.93	26.72	4.00
Foreign Born	43.85	7.01	48.44	7.05
value is missing	-124.51	1.54	-122.60	1.51
F value / adj-R^2	75.25	.0521	70.64	.0518
Cohort	-	-	20.12	2.41
Cohort squared	-	-	-0.15	2.18

F value for the fixed effect variables 4.4016 (p=0.0123)

Wu Exogeneity Test	F value	(p value)	F value	(p value)
Prenatal Care (group)	3.3899	(0.0337)	3.6165	(0.0269)

Birthweight Production Equation - 2SLS (Blacks)

variable	(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept	2830.37	18.98	2490.23	6.75
Predicted Prenatal Care Delay	1.66	1.74	1.08	1.03
Predicted Prenatal Care Visits	-16.77	1.02	-14.58	0.89
Predicted Prenatal Care Interaction	1743.14	1.88	1699.83	1.87
Mother's Education < 7	2.99	0.10	16.32	0.51
7 - 11	-41.62	4.15	-42.42	4.21
13 - 15	25.50	2.46	21.81	2.03
> 15	-7.93	0.53	-5.59	0.37
value is missing	-55.23	1.42	53.95	1.40
Father's Education missing	-52.20	6.14	-50.96	5.97
Narcotics	-	-	-	-
Alcohol	-	-	-	-
Smoking	-	-	-	-
Other Drugs	-	-	-	-
Early Miscarriages	-30.97	2.58	-30.39	2.56
Late Miscarriages	-157.37	8.11	-158.99	8.18
Male sex	115.78	17.16	115.72	17.24
Single mother	-20.89	1.92	-18.58	1.66
Plurality	-881.91	23.54	-890.76	23.33
Private Service	31.13	3.84	31.52	3.84
Foreign Born	53.61	6.88	59.16	7.01
value is missing	-71.59	2.73	-72.41	0.71
F value / adj-R^2	49.20	.0316	46.77	.0320
Cohort	-	-	10.76	1.02
Cohort squared	-	-	-0.07	0.78

F value for the fixed effect variables 2.2496 (p=0.1055)

Wu Exogeneity Test	F value	(p value)	F value	(p value)
Prenatal Care (group)	3.7753	(0.0105)	8.6698	(0.0001)

Birthweight Production Equation - 2SLS (Blacks)

variable	(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept	3001.06	31.34	2501.06	8.30
Predicted Prenatal Care Delay	0.12	0.30	-0.46	0.86
Predicted Prenatal Care Visits	8.34	1.08	10.11	1.26
Predicted Prenatal Care Interaction	-	-	-	-
Mother's Education < 7	0.19	0.01	14.83	0.56
7 - 11	-35.55	4.63	-36.19	4.66
13 - 15	29.85	3.65	25.71	2.99
> 15	1.56	0.14	4.44	0.39
value is missing	1.61	0.08	1.73	0.09
Father's Education missing	-52.40	7.62	-51.04	7.32
Narcotics	-	-	-	-
Alcohol	-	-	-	-
Smoking	-	-	-	-
Other Drugs	-	-	-	-
Early Miscarriages	-36.39	3.87	-35.46	3.76
Late Miscarriages	-152.44	9.80	-154.11	9.80
Male sex	115.85	21.24	115.80	21.12
Single mother	-23.68	2.72	-21.32	2.36
Plurality	-893.08	29.85	-902.16	29.31
Private Service	30.43	4.64	30.73	4.59
Foreign Born	51.55	8.26	57.67	8.41
value is missing	-108.91	1.35	-108.42	1.34
F value / adj-R^2	77.62	.0474	72.22	.0472
Cohort	-	-	15.79	1.89
Cohort squared	-	-	-0.11	1.57

F value for the fixed effect variables 4.6709 (p=0.0086)

Wu Exogeneity Test	F value	(p value)	F value	(p value)
Prenatal Care (group)	2.7426	(0.0644)	3.6165	(0.0001)

Birthweight Production Equation - OLS (Blacks)

variable	(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept	3166.38	187.39	2795.79	12.38
Prenatal Care Delay	-0.01	0.26	-0.01	0.26
Prenatal Care Visits	-7.95	9.08	-7.87	8.97
Prenatal Care Interaction	-42.29	3.68	-42.40	3.69
Mother's Education < 7	-6.12	0.25	-4.43	0.18
7 - 11	-36.52	5.24	-35.49	4.86
13 - 15	33.75	4.47	33.19	4.38
> 15	4.61	0.42	6.24	0.56
value is missing	7.86	0.40	8.61	0.44
Father's Education missing	-52.44	7.94	-52.35	7.92
Narcotics	-263.00	9.35	-262.59	9.32
Alcohol	9.78	0.26	9.48	0.25
Smoking	-124.45	9.70	-125.26	9.75
Other Drugs	-83.95	3.51	-83.44	3.49
Early Miscarriages	-29.50	3.19	-28.99	3.13
Late Miscarriages	-130.29	9.31	-129.58	9.25
Male sex	115.82	21.39	115.81	21.39
Single mother	-26.41	3.64	-26.56	3.58
Plurality	-864.46	35.53	-864.18	32.52
Private Service	30.09	4.66	31.02	4.77
Foreign Born	40.13	6.60	40.72	6.62
value is missing	-144.74	1.82	-144.25	1.82
F value / adj-R^2	78.195	.0548	73.931	.0548
Cohort	-	-	12.08	1.61
Cohort squared	-	-	-0.10	1.57

F value for the fixed effect variables 1.4257 (p=0.2403)

Birthweight Production Equation - OLS (Blacks)

variable	(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept	3162.35	187.52	2795.87	12.38
Prenatal Care Delay	0.02	0.44	0.02	0.44
Prenatal Care Visits	-8.61	10.03	-8.52	9.92
Prenatal Care Interaction	-	-	-	-
Mother's Education < 7	-6.07	0.25	-4.40	0.18
7 - 11	-36.68	5.27	-35.64	4.88
13 - 15	33.65	4.56	33.08	4.37
> 15	4.38	0.40	5.97	0.54
value is missing	6.49	0.33	7.23	0.37
Father's Education missing	-52.44	7.94	-52.36	7.92
Narcotics	-262.97	9.35	-262.58	9.32
Alcohol	9.66	0.26	9.35	0.25
Smoking	-124.66	9.72	-125.47	9.77
Other Drugs	-83.83	3.50	-83.44	3.49
Early Miscarriages	-29.36	3.17	-28.86	3.11
Late Miscarriages	-130.35	9.31	-129.66	9.26
Male sex	115.87	21.40	115.86	21.40
Single mother	-26.35	3.63	-26.49	3.57
Plurality	-864.09	32.51	-864.82	32.50
Private Service	30.25	4.68	31.16	4.80
Foreign Born	40.16	6.60	40.73	6.62
value is missing	-143.90	1.81	-143.41	1.81
F value / adj-R^2	80.131	.0546	75.633	.0546
Cohort	-	-	11.95	1.60
Cohort squared	-	-	-0.10	1.55

F value for the fixed effect variables 1.3905 (p=0.2490)

Birthweight Production Equation - OLS (Blacks)

variable	(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept	3153.53	186.53	2916.95	12.89
Prenatal Care Delay	-0.02	0.29	-0.02	0.39
Prenatal Care Visits	-7.43	8.46	-7.34	8.35
Prenatal Care Interaction	-42.87	3.72	-42.99	3.73
Mother's Education < 7	-4.38	0.18	-2.26	0.09
7 - 11	-40.57	5.81	-42.33	5.79
13 - 15	34.75	4.59	34.98	4.61
> 15	4.83	0.44	7.75	0.70
value is missing	7.94	0.40	8.69	0.44
Father's Education missing	-56.48	8.54	-56.38	8.52
Narcotics	-	-	-	-
Alcohol	-	-	-	-
Smoking	-	-	-	-
Other Drugs	-	-	-	-
Early Miscarriages	-33.99	3.66	-33.00	3.55
Late Miscarriages	-137.03	9.78	-135.95	9.69
Male sex	116.04	21.38	116.03	21.37
Single mother	-28.50	3.91	-30.43	4.10
Plurality	-862.06	32.36	-861.47	32.33
Private Service	33.57	5.19	34.96	5.37
Foreign Born	48.63	8.01	50.13	8.17
value is missing	-132.01	1.66	-131.29	1.65
F value / adj-R^2	80.179	.0499	75.275	.0499
Cohort	-	-	7.03	0.94
Cohort squared	-	-	-0.05	0.81

F value for the fixed effect variables 1.6828 (p=0.1859)

Birthweight Production Equation - OLS (Blacks)

variable	(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept	3149.43	186.66	2917.21	12.89
Prenatal Care Delay	0.02	0.41	0.02	0.32
Prenatal Care Visits	-8.09	9.41	-8.01	9.30
Prenatal Care Interaction	-	-	-	-
Mother's Education < 7	-4.32	0.18	-2.34	0.09
7 - 11	-40.73	5.84	-42.49	5.81
13 - 15	34.64	4.58	34.88	4.59
> 15	4.59	0.42	7.49	0.67
value is missing	6.56	0.33	7.30	0.37
Father's Education missing	-56.49	8.54	-56.39	8.52
Narcotics	-	-	-	-
Alcohol	-	-	-	-
Smoking	-	-	-	-
Other Drugs	-	-	-	-
Early Miscarriages	-33.85	3.65	-32.87	3.54
Late Miscarriages	-137.10	9.78	-136.03	9.69
Male sex	116.10	21.38	116.09	21.38
Single mother	-28.44	3.90	-30.36	4.09
Plurality	-861.68	32.34	-861.09	32.31
Private Service	33.74	5.22	35.11	5.39
Foreign Born	48.67	8.02	50.15	8.17
value is missing	-131.14	1.65	-130.43	1.64
F value / adj-R^2	82.443	.0496	77.232	.0496
Cohort	-	-	6.89	0.91
Cohort squared	-	-	-0.05	0.79

F value for the fixed effect variables 1.6431 (p=0.1934)

Prenatal Care Delay Equation (Hispanics)

variable	(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept	119.77	35.30	45.40	1.81
Mother's Education < 7	7.13	4.74	6.94	4.62
7 - 11	0.12	0.16	0.68	0.90
13 - 15	-5.03	5.34	-5.29	5.62
> 15	-4.68	3.11	-2.36	1.56
value is missing	-5.53	2.59	-5.31	2.49
Father's Education < 7	3.92	2.32	4.49	2.67
7 - 11	1.26	1.53	1.17	1.43
13 - 15	-3.31	3.08	-3.67	3.14
> 15	-2.56	1.65	-1.61	1.04
value is missing	8.96	10.10	9.13	10.32
Self-pay	13.58	16.80	12.99	16.06
Medicaid	9.90	12.97	9.33	12.19
value is missing	14.46	7.96	14.17	7.82
Prenatal care clinics	-0.84	2.72	-0.81	2.64
Family planning clinics	0.26	1.05	0.24	0.99
Unemployment rate	-2.38	6.21	-2.49	6.52
Poverty rate	0.09	3.40	0.07	2.58
Drug deaths	0.03	0.70	0.03	0.77
Early Miscarriages	-3.57	3.55	-2.96	2.94
Late Miscarriages	-7.39	4.20	-7.01	3.99
Teenage mother	9.96	14.55	2.57	2.63
Single mother	7.33	10.77	7.02	10.31
Plurality	-5.43	1.87	-4.64	1.60
Foreign Born	6.86	10.31	8.01	11.97
value is missing	-4.85	3.04	-4.67	0.33
Black	-0.36	0.45	-0.23	0.29
F value / adj-R^2	70.64	.0626	72.11	.0669
Cohort	-	-	1.63	1.93
Cohort squared	-	-	-0.004	0.61

F value for the fixed effect variables 94.5788 (p=0.0001)

Prenatal Care Visits Equation (Hispanics)

variable	(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept	9.94	47.76	18.17	11.80
Mother's Education < 7	-0.28	3.02	-0.28	3.03
7 - 11	-0.10	2.27	-0.08	1.82
13 - 15	0.19	3.31	0.21	3.63
> 15	-0.10	1.10	-0.23	2.50
value is missing	0.38	2.90	0.36	2.79
Father's Education < 7	0.31	2.97	0.28	2.69
7 - 11	-0.08	1.61	-0.08	1.53
13 - 15	0.11	1.63	0.11	1.70
> 15	0.01	0.15	-0.04	0.43
value is missing	-0.49	8.98	-0.50	9.19
Self-pay	-0.11	2.30	-0.09	1.75
Medicaid	-0.17	3.71	-0.13	2.79
value is missing	-0.49	4.43	-0.47	4.24
Prenatal care clinics	0.04	2.25	0.04	2.13
Family planning clinics	0.01	0.22	0.01	0.33
Unemployment rate	-0.12	4.95	-0.11	4.77
Poverty rate	-0.01	8.34	-0.01	7.42
Drug deaths	-0.01	0.36	-0.01	0.64
Early Miscarriages	0.29	4.63	0.25	4.12
Late Miscarriages	0.89	8.21	0.86	8.02
Teenage mother	-0.32	7.68	0.02	0.33
Single mother	-0.23	5.53	-0.22	5.27
Plurality	1.63	9.17	1.59	8.96
Foreign Born	-0.07	1.81	-0.14	3.45
value is missing	0.02	0.02	-0.01	0.01
Black	0.12	2.32	0.11	2.23
F value / adj-R^2	39.06	.0356	41.38	.0395
Cohort	-	-	-0.23	4.46
Cohort squared	-	-	0.001	3.27

F value for the fixed effect variables 83.6235 (p=0.0001)

Birthweight Production Equation - 2SLS (Hispanics)

variable	(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept	3055.81	15.52	1900.38	4.32
Predicted Prenatal Care Delay	-2.76	2.43	-2.52	2.19
Predicted Prenatal Care Visits	83.39	4.01	78.03	3.72
Predicted Prenatal Care Interaction	-2376.73	2.29	-2313.02	2.27
Mother's Education < 7	-21.17	1.03	-22.16	1.06
7 - 11	-11.18	1.08	-12.81	1.27
13 - 15	10.79	0.77	11.57	0.81
> 15	7.76	0.38	15.91	0.80
value is missing	-56.52	1.76	-52.29	1.65
Father's Education missing	7.67	0.54	4.07	0.27
Narcotics	-299.51	6.91	-299.85	7.05
Alcohol	15.68	0.37	15.34	0.38
Smoking	-97.00	4.57	-99.13	4.76
Other Drugs	-37.43	1.00	-36.63	1.00
Early Miscarriages	-33.35	2.31	-30.22	2.12
Late Miscarriages	-117.56	3.34	-112.33	3.15
Male sex	93.81	12.09	93.79	12.33
Single mother	-22.97	2.09	-26.31	2.31
Plurality	-1008.85	21.49	-999.84	21.09
Private Service	25.27	2.47	28.16	2.78
Foreign Born	39.98	3.51	43.48	3.50
value is missing	232.53	0.95	226.41	0.94
Black	19.92	1.46	19.53	1.46
F value / adj-R^2	32.68	.0270	32.12	.0280
Cohort	-	-	37.68	3.37
Cohort squared	-	-	-0.30	3.32
F value for the fixed effect variables			5.7088	(p=0.0033)
Wu Exogeneity Test	F value	(p value)	F value	(p value)
Prenatal Care (group)	21.9304	(0.0001)	12.3311	(0.0001)

Birthweight Production Equation - 2SLS (Hispanics)

variable	(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept	2823.44	22.92	1629.95	5.22
Predicted Prenatal Care Delay	-0.58	1.28	-0.44	0.86
Predicted Prenatal Care Visits	49.23	4.65	46.18	4.02
Predicted Prenatal Care Interaction	-	-	-	-
Mother's Education < 7	9.59	0.66	-10.11	0.68
7 - 11	-16.00	2.16	-17.56	2.40
13 - 15	-0.75	0.08	-0.24	0.02
> 15	9.05	0.61	17.70	1.20
value is missing	-27.70	1.28	-24.88	1.15
Father's Education missing	-8.69	0.96	-10.69	1.06
Narcotics	-300.81	9.51	-301.04	9.60
Alcohol	17.51	0.57	17.49	0.57
Smoking	-97.41	6.29	-99.54	6.48
Other Drugs	-37.22	1.36	-36.41	1.34
Early Miscarriages	-35.51	3.37	-32.67	3.11
Late Miscarriages	-169.66	8.65	-164.43	8.18
Male sex	93.84	16.57	93.81	16.72
Single mother	-21.02	2.63	-23.81	2.85
Plurality	-1030.86	30.74	-1023.51	30.01
Private Service	24.89	3.33	27.61	3.69
Foreign Born	54.06	7.72	58.11	7.43
value is missing	-98.26	0.68	-95.53	0.67
Black	1.99	0.24	2.02	0.25
F value / adj-R^2	62.84	.0492	60.42	.0501
Cohort	-	-	38.67	4.70
Cohort squared	-	-	-0.31	4.58

F value for the fixed effect variables 11.1820 (p=0.0001)

Wu Exogeneity Test	F value	(p value)	F value	(p value)
Prenatal Care (group)	27.4466	(0.0001)	13.3496	(0.0001)

Birthweight Production Equation - 2SLS (Hispanics)

variable	(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept	3055.83	15.11	1924.26	4.25
Predicted Prenatal Care Delay	-2.89	2.47	-2.75	2.32
Predicted Prenatal Care Visits	86.34	4.04	82.29	3.81
Predicted Prenatal Care Interaction	-2504.51	2.35	-2435.98	2.32
Mother's Education < 7	-21.98	1.04	-21.95	1.02
7 - 11	-13.94	1.31	-16.10	1.55
13 - 15	10.73	0.74	10.70	0.73
> 15	8.77	0.42	17.27	0.84
value is missing	-59.34	1.80	-56.05	1.72
Father's Education missing	5.48	0.37	3.49	0.22
Narcotics	-	-	-	-
Alcohol	-	-	-	-
Smoking	-	-	-	-
Other Drugs	-	-	-	-
Early Miscarriages	-36.33	2.45	-33.64	2.29
Late Miscarriages	-118.12	3.27	-114.74	3.13
Male sex	94.60	11.87	94.57	12.08
Single mother	-26.81	2.38	-29.32	2.51
Plurality	-1009.19	20.93	-1002.55	20.55
Private Service	25.01	2.38	27.57	2.64
Foreign Born	45.55	3.72	48.66	3.82
value is missing	239.34	0.95	232.12	0.94
Black	20.29	1.45	19.86	1.44
F value / adj-R^2	32.47	.0238	31.54	.0246
Cohort	-	-	36.44	3.17
Cohort squared	-	-	-0.29	3.07

F value for the fixed effect variables 5.1619 (p=0.0057)

Wu Exogeneity Test	F value	(p value)	F value	(p value)
Prenatal Care (group)	22.8632	(0.0001)	27.2467	(0.0001)

Birthweight Production Equation - 2SLS (Hispanics)

variable	(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept	2811.11	22.75	1639.65	5.20
Predicted Prenatal Care Delay	-0.59	1.30	-0.56	1.09
Predicted Prenatal Care Visits	50.33	4.74	48.74	4.21
Predicted Prenatal Care Interaction	-	-	-	-
Mother's Education < 7	-9.77	0.67	-9.25	0.62
7 - 11	-19.02	2.56	-21.11	2.87
13 - 15	-1.42	0.15	-1.75	0.18
> 15	10.12	0.68	19.16	1.29
value is missing	-28.97	1.34	-27.18	1.25
Father's Education missing	-11.77	1.30	-12.06	1.18
Narcotics	-	-	-	-
Alcohol	-	-	-	-
Smoking	-	-	-	-
Other Drugs	-	-	-	-
Early Miscarriages	-38.61	3.65	-36.21	3.42
Late Miscarriages	-173.03	8.79	-169.62	8.37
Male sex	94.63	16.65	94.59	16.71
Single mother	-24.77	3.09	-26.68	3.17
Plurality	-1032.38	30.67	-1027.48	29.87
Private Service	24.61	3.28	26.98	3.58
Foreign Born	58.40	8.33	64.09	8.14
value is missing	-109.19	0.76	-106.90	0.74
Black	1.37	0.17	1.41	0.17
F value / adj-R^2	65.62	.0455	61.94	.0458
Cohort	-	-	37.47	4.51
Cohort squared	-	-	-0.29	4.34

F value for the fixed effect variables 10.7103 (p=0.0001)

Wu Exogeneity Test	F value	(p value)	F value	(p value)
Prenatal Care (group)	24.2489	(0.0001)	36.2856	(0.0001)

Birthweight Production Equation - OLS (Hispanics)

variable	(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept	3218.53	192.18	2508.14	11.37
Prenatal Care Delay	-0.11	2.09	-0.11	1.86
Prenatal Care Visits	-4.65	5.34	-4.69	5.39
Prenatal Care Interaction	-30.93	2.69	-30.91	2.69
Mother's Education < 7	-33.91	2.59	-29.86	2.28
7 - 11	-35.59	5.58	-27.11	4.10
13 - 15	16.54	1.96	13.91	1.64
> 15	13.75	1.03	10.07	0.75
value is missing	-8.86	0.43	-7.99	0.40
Father's Education missing	-38.52	5.20	-39.17	5.29
Narcotics	-301.99	10.22	-306.00	10.35
Alcohol	19.41	0.67	19.65	0.68
Smoking	-104.39	7.21	-105.18	7.27
Other Drugs	-33.52	1.31	-33.06	1.30
Early Miscarriages	-16.17	1.71	-18.37	1.94
Late Miscarriages	-115.13	6.94	-116.62	7.03
Male sex	93.98	17.76	94.01	17.77
Single mother	-46.26	7.39	-41.80	6.61
Plurality	-936.46	34.27	-939.36	34.38
Private Service	36.97	5.40	34.75	5.03
Foreign Born	54.25	8.87	49.29	7.83
value is missing	-98.06	0.73	-94.99	0.71
Black	6.91	0.91	5.40	0.71
F value / adj-R^2	69.881	.0552	66.807	.0557
Cohort	-	-	25.64	3.51
Cohort squared	-	-	-0.23	3.78

F value for the fixed effect variables 12.3410 (p=0.0001)

Birthweight Production Equation - OLS (Hispanics)

variable	(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept	3215.49	192.43	2504.88	11.35
Prenatal Care Delay	-0.09	1.59	-0.07	1.36
Prenatal Care Visits	-5.09	5.97	-5.14	6.02
Prenatal Care Interaction	-	-	-	-
Mother's Education < 7	-33.78	2.58	-29.72	2.27
7 - 11	-35.66	5.59	-27.18	4.11
13 - 15	16.41	1.94	13.79	1.63
> 15	13.79	1.03	10.11	0.75
value is missing	-8.48	0.42	-7.60	0.38
Father's Education missing	-38.74	5.23	-39.38	5.32
Narcotics	-302.09	10.22	-306.09	10.35
Alcohol	18.91	0.66	19.15	0.66
Smoking	-104.68	7.23	-105.48	7.29
Other Drugs	-33.54	1.31	-33.09	1.30
Early Miscarriages	-16.19	1.71	-18.39	1.94
Late Miscarriages	-115.80	6.98	-117.29	7.07
Male sex	94.08	17.78	94.11	17.79
Single mother	-46.25	7.39	-41.79	6.60
Plurality	-936.74	34.28	-939.64	34.38
Private Service	36.87	5.38	34.64	5.02
Foreign Born	54.42	8.90	49.46	7.85
value is missing	-102.33	0.76	-99.25	0.74
Black	6.67	0.88	5.16	0.68
F value / adj-R^2	71.713	.0550	68.452	.0556
Cohort	-	-	25.65	3.51
Cohort squared	-	-	-0.23	3.78

F value for the fixed effect variables 12.3445 (p=0.0001)

Birthweight Production Equation - OLS (Hispanics)

variable	(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept	3210.12	191.56	2551.79	11.54
Prenatal Care Delay	-0.12	2.12	-0.10	1.91
Prenatal Care Visits	-4.20	4.82	-4.24	4.86
Prenatal Care Interaction	-32.01	2.78	-32.00	2.78
Mother's Education < 7	-34.61	2.64	-30.87	2.35
7 - 11	-39.07	6.12	-31.34	4.73
13 - 15	16.21	1.91	13.79	1.63
> 15	15.00	1.12	11.69	0.86
value is missing	-9.91	0.49	-9.10	0.45
Father's Education missing	-42.12	5.68	-42.75	5.76
Narcotics	-	-	-	-
Alcohol	-	-	-	-
Smoking	-	-	-	-
Other Drugs	-	-	-	-
Early Miscarriages	-19.02	2.00	-21.05	2.21
Late Miscarriages	-117.80	7.09	-119.18	7.17
Male sex	94.76	17.87	94.80	17.89
Single mother	-50.56	8.07	-46.51	7.35
Plurality	-936.66	34.21	-939.32	34.30
Private Service	36.71	5.35	34.70	5.02
Foreign Born	58.69	9.59	54.21	8.60
value is missing	-108.87	0.81	-106.19	0.79
Black	6.33	0.83	8.39	0.62
F value / adj-R^2	72.643	.0511	68.900	.0515
Cohort	-	-	23.73	3.24
Cohort squared	-	-	-0.21	3.49

F value for the fixed effect variables 10.3677 (p=0.0001)

Birthweight Production Equation - OLS (Hispanics)

variable	(without fixed effect) coefficient	|t|	(with fixed effect) coefficient	|t|
Intercept	3206.94	191.80	2548.53	11.52
Prenatal Care Delay	-0.09	1.60	-0.07	1.39
Prenatal Care Visits	-4.66	5.46	-4.70	5.50
Prenatal Care Interaction	-	-	-	-
Mother's Education < 7	-34.47	2.63	-30.74	2.34
7 - 11	-39.16	6.14	-31.42	4.74
13 - 15	16.08	1.90	13.66	1.61
> 15	15.05	1.12	11.73	0.87
value is missing	-9.51	0.47	-8.71	0.43
Father's Education missing	-42.35	5.71	-42.98	5.79
Narcotics	-	-	-	-
Alcohol	-	-	-	-
Smoking	-	-	-	-
Other Drugs	-	-	-	-
Early Miscarriages	-19.04	2.01	-21.07	2.22
Late Miscarriages	-118.49	7.13	-119.87	7.21
Male sex	94.87	17.89	94.91	17.91
Single mother	-50.56	8.07	-46.51	7.35
Plurality	-936.95	34.21	-939.61	34.31
Private Service	36.60	5.33	34.59	5.00
Foreign Born	58.87	9.62	54.39	8.63
value is missing	-113.31	0.84	-110.63	0.82
Black	6.08	0.80	4.69	0.62
F value / adj-R^2	74.795	.0509	70.800	.0513
Cohort	-	-	23.73	3.24
Cohort squared	-	-	-0.21	3.49

F value for the fixed effect variables 10.3689 (p=0.0001)

APPENDIX E

TABLE I Marginal Birthweight Products

Complete Sample - Evaluated at Mean Values

	Whites	Blacks	Hispanics
Substance use variables included			
Delay (F.E.) (grams/day)	-0.208	-1.165	-1.168
Delay (non-F.E.)	+0.243	-0.884	-1.278
Visits (F.E.) (grams/visit)	17.58	7.76	25.12
Visits (non-F.E.)	15.96	10.14	24.37
Substance use variables excluded			
Delay (F.E.) (grams/day)	-0.342	-1.509	-1.264
Delay (non-F.E.)	+0.113	-1.068	-1.314
Visits (F.E.) (grams/visit)	16.99	10.58	25.52
Visits (non-F.E.)	13.96	15.42	24.82

TABLE II Marginal Birthweight Products

Prenatal Care Only Sample - Evaluated at Mean Values

	Whites	Blacks	Hispanics
Substance use variables included			
Delay (F.E.) (grams/day)	-0.490	+0.606	-1.000
Delay (non-F.E.)	+0.051	+0.192	-1.198
Visits (F.E.) (grams/visit)	18.61	-0.55	58.02
Visits (non-F.E.)	14.16	-2.28	62.83
Substance use variables excluded			
Delay (F.E.) (grams/day)	-0.607	-0.051	-1.150
Delay (non-F.E.)	-0.087	+0.500	-1.244
Visits (F.E.) (grams/visit)	17.43	+0.48	61.22
Visits (non-F.E.)	11.92	-1.32	64.68

APPENDIX F

TABLE I Wu-Hausman Exogeneity Tests (Whites)

	without fixed effect	with fixed effect
Complete Sample		
VISITS		
I	11.154	12.326
II	10.407	11.306
III	9.392	11.235
IV	8.797	10.628
DELAY		
I	1.206	3.305
II	0.107	0.971
III	1.060	3.080
IV	0.027	1.353
Prenatal Care Only Sample		
VISITS		
I	13.287	16.468
II	16.780	16.000
III	11.269	15.111
IV	14.360	14.835
DELAY		
I	3.084	7.771
II	1.261	7.510
III	2.837	7.542
IV	1.675	8.535

Critical Chi-Squared 5% : 3.841 1% : 6.635

I = full regression
II = interaction variable excluded
III = substance use variables excluded
IV = interaction and substance use variables excluded

TABLE II Wu-Hausman Exogeneity Tests (Blacks)

	without fixed effect	with fixed effect
Complete Sample		
VISITS		
I	3.957	1.305
II	2.090	0.855
III	7.708	2.910
IV	4.428	1.213
DELAY		
I	2.157	2.415
II	0.158	2.423
III	3.571	4.881
IV	0.041	3.370
Prenatal Care Only Sample		
VISITS		
I	0.235	0.138
II	3.975	4.492
III	0.268	0.154
IV	4.613	5.096
DELAY		
I	1.207	0.487
II	1.042	1.831
III	2.403	0.690
IV	0.071	1.563

Critical Chi-Squared 5% : 3.841 1% : 6.635

I = full regression
II = interaction variable excluded
III = substance use variables excluded
IV = interaction and substance use variables excluded

TABLE III Wu-Hausman Exogeneity Tests (Hispanics)

	without fixed effect	with fixed effect
Complete Sample		
VISITS		
I	9.053	10.831
II	8.475	9.815
III	9.374	10.596
IV	8.676	9.545
DELAY		
I	3.564	3.950
II	3.022	1.724
III	3.888	4.322
IV	2.973	2.284
Prenatal Care Only Sample		
VISITS		
I	18.028	15.690
II	26.068	19.735
III	18.120	17.218
IV	26.829	21.156
DELAY		
I	6.203	5.103
II	2.072	1.025
III	6.376	5.652
IV	2.041	1.447

Critical Chi-Squared 5% : 3.841 1% : 6.635

I = full regression
II = interaction variable excluded
III = substance use variables excluded
IV = interaction and substance use variables excluded

APPENDIX G

TABLE I Descriptive Statistics (Whites)

		Mean	Mode	Median
All	Birthweight	3331	3300	3300
	Delay	83.1	59.5	63
	Visits	10.0	10	10
Married	Birthweight	3345	3300	3300
	Delay	77.0	59.5	59.5
	Visits	10.2	10	10
Single	Birthweight	3230	3300	3300
	Delay	127.1	59.5	94.5
	Visits	8.3	10	8
Adult	Birthweight	3337	3300	3300
	Delay	78.3	59.5	59.5
	Visits	10.2	10	10
Teenager	Birthweight	3274	3300	3300
	Delay	127.0	269.5	94.5
	Visits	8.2	10	8
US Born	Birthweight	3330	3300	3300
	Delay	80.2	59.5	59.5
	Visits	10.1	10	10
Foreign Born				
	Birthweight	3332	3300	3300
	Delay	90.1	59.5	66.5
	Visits	9.8	10	10
HS Grad	Birthweight	3336	3300	3300
	Delay	79.9	59.5	59.5
	Visits	10.1	10	10
Non HS Grad				
	Birthweight	3258	3400	3300
	Delay	126.1	269.5	94.5
	Visits	8.0	10	8
No PNC				
	Birthweight	3065	3300	3100
PNC Only				
	Birthweight	3337	3300	3300

TABLE II Descriptive Statistics (Blacks)

		Mean	Mode	Median
All	Birthweight	3118	3300	3100
	Delay	127.1	269.5	101.5
	Visits	7.7	10	8
Married	Birthweight	3184	3300	3300
	Delay	106.1	59.5	80.5
	Visits	8.7	10	9
Single	Birthweight	3088	3300	3100
	Delay	136.6	269.5	115.5
	Visits	7.3	10	8
Adult	Birthweight	3136	3300	3100
	Delay	116.3	59.5	94.5
	Visits	8.2	10	9
Teenager	Birthweight	3087	3300	3100
	Delay	145.4	269.5	129.5
	Visits	7.0	10	7
US Born	Birthweight	3084	3300	3100
	Delay	133.2	269.5	108.5
	Visits	7.4	10	8
Foreign Born				
	Birthweight	3162	3300	3300
	Delay	119.2	59.5	94.5
	Visits	8.1	10	8
HS Grad	Birthweight	3141	3300	3100
	Delay	118.0	59.5	94.5
	Visits	8.2	10	9
Non HS Grad				
	Birthweight	3061	3300	3100
	Delay	149.3	269.5	129.5
	Visits	6.6	10	7
No PNC				
	Birthweight	2905	2900	2900
PNC Only				
	Birthweight	3140	3300	3100

TABLE III Descriptive Statistics (Hispanics (all))

		Mean	Mode	Median
All	Birthweight	3225	3300	3300
	Delay	132.0	269.5	108.5
	Visits	7.9	10	8
Married	Birthweight	3279	3300	3300
	Delay	118.7	269.5	94.5
	Visits	8.5	10	9
Single	Birthweight	3175	3300	3300
	Delay	144.4	269.5	129.5
	Visits	7.2	10	8
Adult	Birthweight	3253	3300	3300
	Delay	123.7	269.5	101.5
	Visits	8.3	10	9
Teenager	Birthweight	3175	3300	3100
	Delay	127.0	269.5	129.5
	Visits	7.1	10	7
US Born	Birthweight	3175	3300	3300
	Delay	133.2	269.5	108.5
	Visits	7.5	10	8
Foreign Born				
	Birthweight	3247	3300	3300
	Delay	131.5	269.5	108.5
	Visits	8.0	10	8
HS Grad	Birthweight	3255	3300	3300
	Delay	122.3	59.5	101.5
	Visits	8.4	10	9
Non HS Grad				
	Birthweight	3180	3300	3300
	Delay	146.6	269.5	122.5
	Visits	7.1	10	7
No PNC				
	Birthweight	3079	3300	3100
PNC Only				
	Birthweight	3243	3300	3300

TABLE IV Descriptive Statistics (Hispanics (White))

		Mean	Mode	Median
All	Birthweight	3225	3300	3300
	Delay	131.8	269.5	108.5
	Visits	7.9	10	8
Married	Birthweight	3281	3300	3300
	Delay	117.8	59.5 & 269.5	94.5
	Visits	8.6	10	9
Single	Birthweight	3173	3300	3100
	Delay	127.1	269.5	122.5
	Visits	7.2	10	8
Adult	Birthweight	3253	3300	3300
	Delay	122.9	269.5	94.5
	Visits	8.3	10	9
Teenager	Birthweight	3177	3300	3300
	Delay	147.2	269.5	129.5
	Visits	7.1	10	7
US Born	Birthweight	3179	3300	3300
	Delay	132.9	269.5	115.5
	Visits	7.6	10	8
Foreign Born				
	Birthweight	3247	3300	3300
	Delay	131.2	269.5	108.5
	Visits	8.0	10	8
HS Grad	Birthweight	3259	3300	3300
	Delay	121.9	269.5	94.5
	Visits	8.4	10	9
Non HS Grad				
	Birthweight	3175	3300	3300
	Delay	146.8	269.5	122.5
	Visits	7.1	0 & 10	7
No PNC				
	Birthweight	3071	3300	3100
PNC Only				
	Birthweight	3244	3300	3300

TABLE V Descriptive Statistics (Hispanics (Black))

		Mean	Mode	Median
All	Birthweight	3219	3300	3300
	Delay	134.8	269.5	115.5
	Visits	7.7	10	8
Married	Birthweight	3263	3300	3300
	Delay	125.9	269.5	101.5
	Visits	8.3	10	9
Single	Birthweight	3185	3300	3300
	Delay	141.7	269.5	122.5
	Visits	7.3	10	8
Adult	Birthweight	3245	3300	3300
	Delay	129.3	269.5	108.5
	Visits	7.9	10	8
Teenager	Birthweight	3160	3300	3100
	Delay	147.2	269.5	129.5
	Visits	7.2	10	7
US Born	Birthweight	3140	3100	3100
	Delay	136.5	269.5	115.5
	Visits	7.3	10	8
Foreign Born				
	Birthweight	3241	3300	3300
	Delay	134.2	269.5	115.5
	Visits	7.8	10	8
HS Grad	Birthweight	3232	3300	3300
	Delay	126.1	269.5	101.5
	Visits	8.2	10	8
Non HS Grad				
	Birthweight	3202	3300	3300
	Delay	146.2	269.5	122.5
	Visits	7.1	0	7
No PNC				
	Birthweight	3113	3300	3100
PNC Only				
	Birthweight	3232	3300	3300

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