

RACIAL DISPARITIES, BIRTH OUTCOMES,  
AND CHANGING DEMOGRAPHICS  
OF EAST BATON ROUGE PARISH, LOUISIANA

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To Martin Hugh-Jones for putting up with me all of these years and listening through all of my vent sessions, both related to my research projects and well, the other aspects of my life.

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## Abstract

Racial and socioeconomic disparities persist throughout the country regardless of which specific disparity is studied; however, some geographic regions experience more significant racial disparities. East Baton Rouge Parish, Louisiana has a large racial disparity among birth outcomes. Many factors impact the degree of racial disparities, some of which include racial segregation, isolation, or centralization, access to and quality of medical care, and factors of the neighborhood environment. EBRP has undergone dramatic shifts in the demographics of its residents. The purpose of this dissertation was to study the demographic changes in the population; as well as to study the disparities among the birth outcomes of infant mortality, low birthweight, and preterm delivery. To conduct this study, GIS and multilevel analysis were heavily utilized.

Census data from 1970, 1980, 1990, and 2000 census periods were used to determine demographic changes in the parish of East Baton Rouge. The analysis found that EBRP is becoming more racially and economically segregated as the surrounding parishes have increased in population and become flourishing suburbs of the city of Baton Rouge. EBRP has experienced all five dimensions of segregation: unevenness, isolation, clustering, centralization, and concentration. Throughout the thirty year study period, the inner-city area of EBRP has continuously become more populated by poor black residents, and the area directly surrounding the inner city has also changed from a predominately white middle-class area to a predominately black middle-class area.

A total of 75,170 birth certificates records from the years 1990 through 2001 were available for analysis. Eight separate multilevel regressions were conducted using data from two census periods at the block group and tract geographic area for both preterm

delivery and low birthweight. The multilevel regressions showed that the amount of racial and socioeconomic segregation in the block group or tract were significant in the model. The higher the percentage of black residents in the census area, the more likely a woman is to deliver preterm or a low birthweight infant. A correlation analysis found that high poverty and high percentage of black residents found the two variables to be highly correlated.

## Chapter 1: Racial Disparities in Health

### 1.1 Introduction

The topic of racial disparities has recently been brought to the forefront of concerns for public health professionals. The intensity of various racial disparities has been acknowledged for some time now, but it wasn't until around the time when David Satcher called attention to the situation that major initiatives became public knowledge. The Centers for Disease Control, the Department of Health and Human Services, and then President Bill Clinton were also acknowledging the problem. Bill Clinton launched the President's Initiative on Race, One America in the 21<sup>st</sup> Century in June of 1997. In 1998, a report entitled *Changing America: Indicators of Social and Economic Well-Being by Race and Hispanic Origin* was released and contained information regarding disparities in several areas, not just those related specifically to health. The overall conclusion was that minorities are less advantaged than white, non-hispanics (Council of Economic Advisors, 1998).

The Centers for Disease Control took a very drastic step in their goal of eliminating racial disparities. When the Healthy People 2000 report came out, different goals for the decade were established for the different races. But in Healthy People 2010, the same goal was given for everyone (U.S. Department of Health and Human Services, 1991; U.S. Department of Health and Human Services, 1998). While the goal is most likely unobtainable, it is a bold statement that racial disparities in health must be eliminated.

The Department of Health and Human Services commitment to the end of racial disparities is addressed in the HHS Initiative to Reduce Racial and Ethnic Disparities in

Health. It focuses on six areas which seem to be the most crucial in the improvement of health. These areas are infant mortality, cancer screening and management, cardiovascular disease, diabetes, HIV/AIDS, and childhood and adult immunizations (U.S. Department of Health and Human Services, 1998).

Not only has the increased interest in reducing racial disparities been related to actually improving the health and well-being of minorities, but attention has also been given to the changing demographics of the country. The percent population of minorities is increasing and that of white, non-Hispanic is declining. It is projected that by 2050, the American population will be very different from what it is now. In 1970, over 80% of Americans were white, non-Hispanic with black, non-Hispanic, Hispanic, Asian, and American Indian representing less than 20% of the entire United States' population. In 2050 the projection is that only a little over 50% of the population will be white, non-Hispanic with the above listed minority groups representing the other near 50% (Council of Economic Advisors, 1998). The rapid change is not due to immigration alone, but also to the fact that the U.S. white, non-Hispanic population is becoming older and that the racial and ethnic minorities account for a large proportion of young children and adolescents (U.S. Public Health Service, 1991). This younger population is having more children and it is estimated that by 2020 minority children will make up 40% of the United States' child population (U.S. Department of Commerce, 1992). Another complicating factor for the goal of reducing racial disparities is that the number of people recognizing that they belong to more than one race is increasing. Interracial marriages tripled between 1960 and 1990 (Harrison and Bennett, 1995). The 2000 Census acknowledged this and allowed citizens to check off more than one race.

If the projections hold true, it will result in a rapid change in the population, and if the current racial disparities are not reduced before the potential rapid demographic change occurs, the overall health of the country will not be what it is today. The health of a country is an indicator of its overall status and in some areas the United States has ranked and/or currently ranks well behind that of other nations. Two of these areas are average life expectancy and infant mortality. In 1960, the United States was ranked 13<sup>th</sup> and 17<sup>th</sup> respectively for women's and men's life expectancy. In 1995 the rankings has slipped to 20<sup>th</sup> and 21<sup>st</sup> respectively (Doctor's Guide, 1997). Another example is with infant mortality. In 1995, the United States ranked 23<sup>rd</sup> out of 29 industrialized nations—this ranking has not varied much between years (ibid). And in 2002, for the first time since 1958, the country's infant mortality rate increased above that of the previous year from 6.8 per 1000 in 2001 to 7.0 in 2002. This increase was primarily due to the fact that more very low-birthweight infants were born in 2002 and that these infants have a higher rate of mortality, but regardless of the reason for the increase, it is a move in the wrong direction (Kaisernetwork.org, 2005).

The nationwide initiative set forth by public health professionals has been accepted and taken on by various national, state, and local agencies or programs. One is the national Healthy Start program. A local Healthy Start program exists in Baton Rouge and the focus of the local program is to reduce racial disparities in birth outcomes. The success of the nationwide initiative to reduce and/or eliminate racial disparities depends upon the actions of smaller programs, such as Healthy Start, which also operates in many cities across the country. These smaller programs will make an impact over time in the reduction of racial disparities, but the elimination of these disparities is an extremely

complex issue with numerous factors coming into play. Some of these factors go beyond the usual focus of public health professionals to include social theories and anthropology.

Race is a social, not natural, category and the social environment of race has been passed down from generation to generation. Each race and/or ethnic group has a certain degree of unique culture and social patterns that must be acknowledged and addressed. To a certain degree, the problem of racial disparities is further complicated by socioeconomic status and poverty. Racial minorities are more likely to be of a lower socioeconomic status and more likely to be poor or in poverty. Therefore, many approaches to reducing racial disparities must also have a dual approach of including the reduction of socioeconomic disparities in order to fully enhance the overall population of racial/ethnic minorities. There is potential for change in the United States' health ranking and the population of racial minorities holds the key. As stated in *Healthy People 2010*—"the greatest opportunities for improvement and the greatest threats to the future health status of the Nation reside in the population groups that have historically been disadvantaged economically, educationally, and politically" (U.S. Department of Health and Human Services, 1998). This group largely encompasses racial minorities.

While the socioeconomic position must also be addressed, the combination of low socioeconomic status and racial disparities cannot be approached as if they were one and the same because many racial minorities are not poor and racial disparities persist across all socioeconomic levels. It is the specific population in which the minorities are of the lowest socioeconomic status that has to overcome multiple barriers at the same time. But even adding the socioeconomic status as a further reason for racial disparities is not clear cut because the Hispanic/Mexican-American population is typically of lower

socioeconomic status but has health outcomes more similar to that of white, non-Hispanics. This is not true for the black population. They have lower health outcomes across all socioeconomic levels. Because this project is an analysis of East Baton Rouge Parish and the East Baton Rouge Parish contains only a small percentage of racial minorities who are not African-American, the focus of this dissertation will be an analysis of the racial disparities between the black and white populations.

### 1.2 The Complexity of Reducing Racial Disparities in Birth Outcomes

The Baton Rouge Healthy Start program's goal is to reduce racial disparities in perinatal health. While it is a very important goal, it is not one that will be quickly or easily achieved. So many social and economic factors compound with the medical needs surrounding pregnancy, childbirth, motherhood, and infancy that it will be years before any significant changes are made in the reduction of health disparities. While the program may detect a rapid change in the number of children receiving immunizations and having a medical home, changes surrounding infant mortality, preterm delivery, low birth weight, and adequate prenatal care will not be so quickly seen on a population level.

A rapid change will not be seen in infant mortality, preterm delivery, and low birth weight because these are complex etiologies beyond that which prenatal care can correct. Prenatal care will not automatically correct years of poor nutrition, inadequate health care, or a host of other social and economic conditions that plague the health of many minorities in America. Economic conditions are mentioned because it is well known that minorities are more likely to be of lower socioeconomic status than white, non-Hispanics. The 1990 census found that 34% of black women were below the poverty line in comparison to only 11% of white women (U.S. Bureau of Census, 1990).

Low socioeconomic status makes health conditions worse for a large percentage of minorities, but it does not completely explain the racial disparity found in many medical, social, and economic areas. Racial disparities exist within and across socioeconomic levels.

Some areas in which racial disparities have been documented include but are not limited to intimate partner violence, nutrition, intrauterine infection, HIV/AIDS, prenatal care usage, mortality, access to health care, low birth weight, preterm delivery, lead exposure, female-headed households, computer usage, educational attainment, teenage pregnancy, income, poverty, violence, health insurance coverage, adults under correctional supervision, home ownership, physical deterioration of housing, and inner city location of residence. Some of these areas also affect those of lower socioeconomic status, but some are purely racial disparities. Most of these conditions listed above have an impact on perinatal health through its impact on maternal health. Child health is also affected by these disparities.

What is going to make Healthy Start of Baton Rouge show some success in their program is the amount and length of time they work with the women and the content of the program. The Healthy Start program has employed social workers and nurses who go to the home of the client during her pregnancy and follow her and the child for 2 years after delivery. Attention is placed not only on ensuring a healthy pregnancy, but also on setting the standard for a healthy lifestyle for themselves and their baby. The home visitors assist the client in acquiring adequate housing, preparing the home for the baby, finding employment and childcare, and educating herself about the needs of her baby. The home visitor will do risk assessment, depression screening, home-readiness

screenings, simple nutrition counseling, and needs assessment. If issues come up during any of these screenings and assessments, the home visitor will make referrals to various agencies better prepared to handle the woman's need. The home visitor will not be able to address each and every medical, social, and economic condition needed to completely change the outlook of each client and the future condition of her neighborhood, but hope that the client will see this as the chance to begin setting a healthy standard for her life. This program will have an impact on maternal and child health because of its potential for community intervention and the focus on social, economic, cultural, and psychological antecedents of racial disparities.

The Healthy Start program protocol is supported by previous studies. A study published in 1987 studied the impact of addressing non-medical issues during prenatal care. Low-income women were divided into two groups with one group receiving care at the county health department and the other half receiving care with private practice physicians. The group receiving care at the health department saw nurse practitioners rather than physicians and during the prenatal visits received counseling on nutrition and several other factors related to personal health. Referrals were made to appropriate agencies and all referrals and missed clinic appointments were followed up. The women receiving care at the clinic received more social support and guidance. Also, they were remembered and recognized by the nurses, and if they weren't there for an appointment, someone at the clinic would inquire as to why. The study found that women receiving care at the health department were half as likely to have a low birth weight baby as those receiving care with a private practice physician (Buescher et al, 1987).

A program, similar to that of Baton Rouge Healthy Start, which is located in North Carolina has also shown promising results. The Baby Love program in Durham, North Carolina assigns nurses and social workers to pregnant women. The nurses and social workers help the women receive things they need for the baby and also visit mothers and babies at home. They look for infection, drug habits, or other risk factors for preterm delivery. This program is credited with playing a role in the county's infant mortality rate dropping to a record low of 6.3 per 1000 in 2001; this represents a 15% decline from the previous year. The county's infant mortality rate is now 26% below the state average (Bickley, R; 2002).

A third study on the effect of enhanced prenatal care found that higher risk women receiving home visits had lower infant mortality, less preterm delivery, more twins carried to term, fewer prenatal and infant re-hospitalizations, and savings to the healthcare system of 750 hospital days and 2,880,00 dollars (Brooten, D; 2001). Obviously, enhanced and extended prenatal care is a crucial element in improving perinatal health among low-income women (or any woman for that matter) and this is precisely what the Healthy Start program of Baton Rouge is doing.

### 1.3 Disparities in Health

This section will begin with a brief discussion on some of the racial, socioeconomic, and social disparities in health and how they can potentially have a negative effect on women beginning even before their reproductive years and continuing on through those years. Discussion will also show how many of these socioeconomic and social disparities interplay with racial disparities. Even when controlling for socioeconomic disparities, racial disparities still exist. Racial disparities are not the same

as socioeconomic disparities even though they may overlap and one may make the other worse. It is also important to note that even with all of the evidence acknowledging a distinction between racial and socioeconomic disparities, many still believe that the racial disparities in health are entirely due to socioeconomic disparities. This misconception must be eliminated so that the national initiatives to reduce racial disparities will be able to focus on the root of the problem. To resolve any uncertainty in the definitions used in this paper they are defined below. The definition taken for socioeconomic status is from Williams and Collins (1995) and states that socioeconomic status includes “living conditions and life chances, skill levels and material resources, relative power and privilege” thus going beyond what is commonly used as the markers for socioeconomic status (education, income, and occupation). This definition allows for the capture of life history which is important in terms of perinatal outcome because a woman’s reproductive outcomes are not shaped merely by the experiences during pregnancy, but by the experiences of her entire life (including a childhood which may have less advantaged than what she is currently experiencing). Recognizing the life span perspective is crucial during discussion of socioeconomic and certain racial disparities on health because it allows for the generation effect. The best example of this is with a study that found that women who were low birth weight themselves at birth were more likely to give birth to a low birth weight baby (Sanderson et al., 1995). This result persisted regardless of the mother’s current socioeconomic status. This study also raises concern that it may take generations to make significant changes to the birth weight of babies—this has direct effects on the black population. A black woman is significantly more likely to give birth to a low birth weight baby than a white woman.

### 1.3.1 Neighborhoods

An understanding of the significance of socioeconomic disparities is important when addressing racial disparities in perinatal health because of the fact that minorities are disproportionately represented among those of lower socioeconomic status. One example of how a socioeconomic disparity can have an effect upon perinatal health and racial disparities is with the neighborhood and housing. The women living in neighborhoods with lower socioeconomic status have to adjust to the condition of the public space. Decay, abandonment, and other environmental strains can be found in many low-income neighborhoods throughout the United States and these living conditions have a negative effect upon those who must live there. Affordable housing in lower income neighborhoods is also a huge factor for many mothers, and then if they find affordable housing, the condition of it may not be adequate. One wouldn't have to talk to many residents of the complexes providing low income housing/affordable housing to hear complaints about plumbing, heat, hot water, deterioration, rodent infestation, lack of sanitation, violence, drug dealing, racial discrimination, and lack of places to buy quality food (Mullins L and Wali A, 2001). But some of the same complaints expressed by women living in low income housing are also expressed by black women of higher socioeconomic status living in predominately black neighborhoods; these women feel that because they live in a predominately black neighborhood they are discriminated against based upon race (ibid). A legacy of residential segregation is likely the cause of this. A second example of the consequences of racial segregation is the black, non-Hispanic professionals are more likely than white, non-Hispanic professionals to live in working class and less affluent neighborhoods, and black, non-Hispanic families below

the poverty line are more likely than white, non-Hispanic families living below the poverty line to be concentrated in impoverished neighborhoods (Jaynes, G.D. and Williams, R.M., 1989; Morgan, B.P., 1983).

The neighborhood in which one lives can have effects beyond just those previously mentioned. These other neighborhood effects include categories of resources (availability and accessibility of quality schools, child care, recreational activities, services, and opportunities); relationships (parental characteristics, support networks available to parents, and the quality and structure of the home environment); and norms or collective efficacy (existence of formal and informal institutions to monitor residents' behavior and the presence of physical risk to residents) (Leventhal and Brooks-Gunn, 2000). These neighborhood effects are present in all neighborhoods regardless of socioeconomic status, but the effects on those living in neighborhoods characterized by violence, discrimination, or low-income differ from those found in more affluent neighborhoods. Neighborhoods with affluent people are associated with higher verbal ability scores among children and lower behavior problem scores (Klebanov et al., 1997, 1998). This could largely be due to the acknowledgement that "neighborhood income is similar to family income in that it is a structural feature" (Fuligni, A.S., and Brooks-Gunn, J., 2000). When considering this statement a racial disparity could easily be brought up on the basis of neighborhood income. It is understood that on all levels of education and occupational status, blacks are paid less than whites; this is a racial disparity in payment based upon skill and this racial disparity in family income corresponds to a disparity among racially segregated neighborhoods. This neighborhood disparity can have harmful effects on the residents. One study found that socioeconomic

conditions in communities and neighborhoods, independent of individual socioeconomic characteristics, were associated with differences in pregnancy outcomes (Collins et al., 1997). Another found that household class measure at the level of census block group in California served as a better predictor of individual birth outcomes than did the mother's own social class (Krieger, 1991). A more recent study dealing with perinatal outcomes found that black, non Hispanic women living in a neighborhood with high or low median income levels had an increased risk of preterm delivery and that black, non Hispanic women who resided in neighborhoods experiencing large increases or decreases in the proportion of black, non Hispanic residents were also at risk (Pickett, K.E. et al, 2002).

Crime rates also vary by neighborhood with more crimes occurring in neighborhoods with higher percentages of minorities or of lower socioeconomic status. Black, non Hispanics are more likely to be a victim of crime than white, non-Hispanics. Black, non-Hispanics represented 43% of arrests for crimes while they represented about only 13% of the total population (Council of Economic Advisors, 1998). For the crime of homicide, black, non-Hispanics are six times more likely to be a homicide victim than is a white, non-Hispanic (Freeman, R.B, 1992). A crime more commonly found among unemployed or low-skilled men is illegal drug dealing. Crack cocaine is more commonly sold and used by black, non-Hispanics (McDonald, D.C. and Carlson, K.E., 1993). Crime can have serious psychological, economic, and health benefits for the victim and/or the victim's family. But the effects of crime go beyond that of the family to include the neighborhood and the community. The continued presence of crime, specifically violent crime, can cause distressing alterations in the daily lives of residents. Some will have to alter their lifestyle to better ensure their safety and this can also have

serious psychological, economic, and health consequences. Crime will impact individuals, neighborhoods, and communities.

The importance of the neighborhood environment can not be taken for granted when considering any aspect of health, whether mental, reproductive, or societal because of the effect it has upon residents, especially if the effect is negative. Neighborhoods also show that socioeconomic and racial disparities are present at a community level as well as an individual level. This topic will be discussed further in a later section.

### 1.3.2 Life Expectancy and Medical Care

A socioeconomic and racial disparity also exists with mortality and life expectancy. While people of lower socioeconomic status have a lower life expectancy than those of a higher socioeconomic status, black-non Hispanics have a lower life expectancy than white, non Hispanics at all levels of socioeconomic status thus creating a racial disparity in life expectancy (House, J.S. and Williams, D.R., 2000). It is believed that one reason for this socioeconomic and racial disparity is that, on average, white, non Hispanics have better access to preventive health medicine and to the social and economic resources necessary for a healthy lifestyle and environment. A second reason is that black, non Hispanics are less likely to have insurance coverage than white, non Hispanics (Council of Economic Advisors, 1998). Both of these reasons are largely due to differences in income and both reasons are correlated as well. Two other reasons for a lower life expectancy among minorities are not directly related to income, but rather to social factors. These reasons are minorities receiving inferior care from physicians and a general distrust of physicians among minorities. It is also important to note that the racial difference in life expectancy and health is not related to genetic differences. Rather, as

previously stated, the racial disparities are due to social conditions. Sickle cell anemia, a genetic disease found exclusively in the black, non-Hispanic population, is estimated to account for three-tenths of one percent of the total excess deaths in the black, non-Hispanic population (Cooper, R. 1984).

Improving access to medical care and ensuring that minorities have adequate health insurance is not likely to reduce disparities in health and life expectancy (Adler, N.E. 1993; Lantz, P.M. 1998) . Simply making it easier or more affordable to receive medical care is not going to guarantee that one receives the care because they represent only a portion of the barriers. Also, current medical care isn't going to correct or replace health insults during the earlier years of that person's life span. Medical care must extend beyond these barriers to include the other barriers of inferior care and distrust in physicians.

The topic of minorities receiving inferior care from health care professionals is distressing. Numerous studies have noted different areas in which minorities have received inadequate care and the lack of care occurs in both physicians' offices and hospitals. A recently published study found the disparity in care exists even when insurance and income are the same between the races (Stolberg, S.G. 2002). The study went further to emphasize certain areas in which a disparity in quality of health care has occurred. These areas include appropriate medications for heart disease, bypass surgery, kidney dialysis, kidney transplants, and sophisticated treatment for HIV. The study went on to state that these disparities in health care have caused higher death rates among minorities from cancer, heart disease, diabetes, and HIV infection (ibid). Another recent study found that black, non-Hispanics were less likely to have breast cancer screening,

eye exams for diabetics, beta-blockers after a heart attack, and follow-up hospitalization for mental illness (Schneider, 2002). Other noted disparities in care include angiography and bypass surgery (Ford E. et al. 1989), long-term hemodialysis or kidney transplant (Kjellstand C.M. and Logan, G.M. 1987), intensity of care provided for inpatient treatment of pneumonia (Yergan, J. et al. 1987), and cesarean section delivery (de Regt, R.H. et al. 1986). The only disparity listed above that did not remain after controlling for income and/or insurance coverage was cesarean section delivery. Other disparities beyond these mentioned have been noted (Fiscella, K. et al. 2000). An interesting note is that while the black, non-Hispanic population is less likely to receive the above procedures, they are more likely to receive less desirable procedures. For example, a committee review found that among Medicare beneficiaries, “blacks were 3.6 times as likely as whites to have their lower limbs amputated as a result of diabetes” (Stolberg. 2002).

Residential or geographic segregation also plays a role in quality of medical care for racial minorities. African-American and white patients are treated by different groups of physicians. A portion of routine doctor visits by both African-American and white Medicare beneficiaries were analyzed, and it was reported that 22% of the physicians involved provided care at 80% of visits by African-American patients and only 22% of visits for white patients. Of the visits by African-Americans, 27.8% were to doctors who reported that they were not able to provide high quality care to all patients; for white patients the percent was only 19.3% (p=0.005). The physicians treating African-American patients were also less likely to be board certified (77.4%) compared to those of white patients (86.1%, p=0.02). The physicians treating African-American patients

also reported more difficulty in obtaining non-emergency hospital admission, high-quality diagnostic imaging, and referrals to specialists (Bach, P.B. et al; 2004).

Reasons for the difference in treatment between the races varies depending upon who is asked or what study is referenced, but a recent study by the Institute of Medicine found that racial bias, racial stereotypes, and the low number of minority physicians are key factors. While interviewing physicians, “the researchers found classic negative racial stereotypes...such as assumptions that black patients would be less likely to participate in follow-up care” (Stolberg, S.G. 2002). Racism has a profound effect on health and a study performed by a group of Harvard researchers found that “a 1% increase in incidences of racism translates to an increase in 350 deaths per 100,000 African Americans” (Kirchheimer, S. 2003). Physicians’ decisions were influenced by their perceptions of race and in some cases the perception may be held subconsciously. It is also interesting to note that many medical schools do not offer culture-sensitivity classes. A 1994 survey found that only 13 of 78 medical schools offered these classes and in only one school was the class a requirement; the others offered the class as an elective (Lum CK and Korenman SG. 1994). A survey of U.S. residents found that 57% of the black population felt that health care providers treated minorities differently; an opinion was also expressed among these residents that one way to correct the problem is to increase the number of minorities in the health care field (Late, M.; 2003).

There is also large amount of distrust in physicians among the black, non-Hispanic population. The distrust began with the 1932-1972 Tuskegee syphilis study in which nearly 400 black men were denied treatment for syphilis so that physicians could watch the disease’s progression. This study resulted in a reservoir of mistrust among the

black, non-Hispanic population that still lingers on today. A recent study found that 80% of the black, non-Hispanic population surveyed believed that they could be used in an experimental research project without their consent. The study also stated that 63% of black, non-Hispanics versus 38% of white, non-Hispanics felt their physicians prescribed medication as a way of experimenting without their knowledge or consent and that 25% of black, non-Hispanics compared with 8% of whites believed their doctor had given them an experimental treatment without their consent (kaisernetwork.org. 2002). The lead researcher of this study found that the results were the same across all education and income levels. A second study found that minority group members reported less positive perceptions of physicians than whites and that minority group members lacking physician continuity on repeat clinic visits reported even less positive perceptions of physicians (Doescher et al. 2000). It is crucial that the distrust between minorities and physicians be resolved because this affects the quality of medical care received and it is well known that quality medical care is important for the continued health of individuals.

Tying into the general mistrust of physicians by the black, non-Hispanic population is a disparity in a willingness to participate in medical research studies. This further stresses the need of the medical community to build solid relationships across all racial lines. Black, non-Hispanics are less likely to participate in medical studies because of a higher level of mistrust and a belief that they will bear most of the risks involved with the research study (Shavers V.L. et al. 2002).

### 1.3.3 Nutrition and Exercise

There is also a racial and socioeconomic disparity in the prevalence of overweight and obese adults and children. Obesity is becoming a national epidemic and the health

consequences associated with it are staggering. Being overweight or obese is linked to an increased risk of negative birth outcomes such as cesarean section, stillbirth, low birth weight, preterm delivery, and infant mortality, as well as diabetes, heart disease, liver disease, some types of cancer, arthritis, blindness, kidney disease, and amputation; couple the increased risk with inadequate medical care and the racial and socioeconomic disparity will only get worse.

Articles published in USA Today (2002a; 2002b) reported that in 2000, almost 65% of American adults were overweight or obese. Of adults over the age of 20, 34% were overweight (10 to 30 pounds over a healthy weight) and 31% were obese (30 pounds or more over a healthy weight). A racial disparity was found in the rates of obesity. While 33% of adult women are obese, 50% of black, non-Hispanic women were obese compared to 30% of white, non-Hispanic women. Approximately 5% of the adult population is extremely obese, but 15% of black, non-Hispanic women are extremely obese. Little difference in obesity is found among men based upon race.

The racial disparity is also seen in children. About 15% of 12- to 19-year olds were overweight in 2000; but among black, non-Hispanic girls, the rate was 27% (USA Today 2002c). This high rate of overweight teenage girls and women, especially the black-non-Hispanics, could have a future impact upon their childbearing because women who are overweight before their pregnancy are at increased risk of complications during their pregnancy and are less likely to lose the weight gained during pregnancy after they deliver. Being overweight or obese also increases the risk of preterm delivery, which increases the risk of low birth weight and infant death.

The reasons behind the increase in obesity being seen nationwide is poor nutrition and lack of exercise, conditions which many say are due to an individual's personal attitude towards their health. While personal commitment to maintaining an adequate weight and state of being is a key factor, it is not the only factor. Many social issues come into play. One reason is the lack of supermarkets and/or quality food in poor and/or predominately black, non-Hispanic neighborhoods. One recent study found that while 31% of white, non-Hispanics lived in a neighborhood with at least one grocery store, only 8% of black, non-Hispanics had at least one grocery store. White, non-Hispanic neighborhoods had an average of five times as many grocery stores as black, non-Hispanic neighborhoods (Kaiser Network Report, 2002). To further complicate this matter, grocery stores in predominately poor areas typically have "lots of choices for unhealthful foods such as soft drinks and snack foods but virtually no choices of fruits, vegetables, or other healthful foods" (USA Today 2002c).

Unhealthy food is cheaper, more convenient, and easier to find than healthy food and this can be a major area of concern for many minorities and the poor. For urban dwellers depending upon public transportation, finding fresh produce and healthy food could involve bus transfers and 40 or more minutes of commuting, not to mention having to get "on public transportation with a grocery cart."(Kaiser Network Report, 2002). One researcher stated that "in some neighborhoods, it's easier to get an artery-clogging piece of fried chicken than it is to get a fresh apple" (ibid). Fast food restaurants are predominant and many major intersections provide passer-bys with numerous choices of unhealthy places to eat with the vast majority serving fried foods that are cheaper than a fresh cooked meal with materials purchased in a local supermarket. In a society with the

majority of people being stressed for time and money, many have turned to fast food as a part of their routine. One study found that 71% of respondents eat fast food up to three times a week with single women with children being the largest consumers of fast food (Mullings L and Wali A, 2001). Female-headed households are more common among racial minorities.

Unhealthy eating by minorities or the poor is not necessarily always a matter of choice, but a matter of the environment and economics. The same can be said for exercise. Exercise clubs are less common than grocery stores and are predominately located where demand is the greatest, not in lower-income neighborhoods where few residents can afford the monthly fees. It may also be difficult to exercise in the neighborhood because of safety or the lack of parks (USA Today, 2002c).

The racial disparity found in obesity, inadequate nutrition, and lack of exercise only further complicates that fact that black, non-Hispanics are less likely to receive medical care and, when they do receive it, are more likely to receive inferior care. The problems also will have a considerable impact on the economic cost of medical care, not to mention the social costs faced by the individual, the family, and the community. These topics discussed previously are just a few examples of how life circumstances arising before pregnancy can have an impact on maternal and infant health.

#### 1.4 Racial Disparities in Maternal and Child Health

There are many racial disparities in maternal and child health with the most recognized being infant mortality, prenatal care usage, low birth weight, and preterm delivery. There is also a significant racial disparity in maternal mortality, although it is not as well known as the racial disparity in infant mortality. As previously stated, infant

mortality is one of the six areas determined by the U.S. Department of Health and Human Services (1998) in which improvement in racial disparity is crucial for improving health. These racial disparities persist across all socioeconomic levels and in some cases the disparity is even greater in the higher socioeconomic level.

#### 1.4.1 Infant Mortality, Low Birth Weight, and Preterm Delivery

The racial disparity found in infant mortality is a problem which cannot be overlooked; currently in the Baton Rouge area, black, non-Hispanic infants die at a rate of about 3-4:1 when compared to white, non-Hispanic infants. Nationwide, infant mortality rates have dropped considerably over the last half century, but the racial disparity has been increasing. In 1980 the national infant mortality rate was 12.6 per 1000 with the ratio representing racial disparity being 2.0; by 2000 the infant mortality rate had dropped to 6.9 per 1000 while the racial disparity had increased to 2.5 (MMWR 2002). A child born in Czechoslovakia or Bulgaria has a better chance of surviving its first year of life than a black child born in the United States (Commission on the Prevention of Infant Mortality, US Congress 1990).

The leading causes of death among infants also differ by race and the three leading causes have remained the same over the last decade. In 1991, congenital anomalies were the leading cause of infant death among white, non-Hispanic infants and the third leading cause of death among black, non-Hispanic infants (Singh G.K. and Yu S.M. 1995). Prematurity and/or low birth weight was the third leading cause of death among white, non-Hispanic infants and the leading cause of death among black, non-Hispanic infants (ibid). In 1991, one of every six infant deaths was due to prematurity and/or low birth weight. Sudden infant death syndrome (SIDS) was the second leading

cause of death in both races (ibid). However, in 1998 and 2000, low birth weight was the second leading cause of infant death among white, non-Hispanics and SIDS was the third leading cause of infant death among both races. Congenital anomalies replaced SIDS as the second leading cause of infant death among black, non-Hispanics (Mathews T.J. et al. 2000; Mathews T.J. et al. 2002), but low birth weight continued to be the leading cause of death among black, non-Hispanic infants. The reduction in deaths due to SIDS was largely to the American Academy of Pediatrics “Back to Sleep” campaign encouraging parents to reduce SIDS by placing children on their backs when sleeping, but rates of SIDS are over twice as high among black, non-Hispanic infants than white, non-Hispanic infants (Hauck, F.R. et al. 2002).

Many infant deaths are the result of low birth weight (<2500 grams) and/or preterm delivery (<37 weeks), complications more prevalent in the black, non-Hispanic population. One reason for the decline in the infant mortality rate has been a better survival rate among babies born too soon or too small even though the rate of low birth weight infants is increasing. Between 1980 and 2000 the percentage of low birth weight infants increased 11.8% and the percentage of very low birth weight (<1500 grams) increased 24.3% (MMWR 2002). The number of infants born of a very low birth weight also increased from 2001 to 2002, with very low birth weight being the cause of death for about 41% of all infant deaths for the year 2002. Infant deaths rose among all racial groups in 2002 (kaisernetwork.org; 2005). In the 1990’s the rate of low birth weight black, non-Hispanics declined slightly, but is still more than twice that of white, non-Hispanics, which rose slightly during the 1990’s (U.S. Department of Health and Human Services, 1998). In 1998, of black, non-Hispanic infants, 3.2% were very low birth

weight, 13.2% were low birth weight, and 17.6% were preterm; of white, non-Hispanic infants the percentages were 1.2, 6.6, and 10.2, respectively (Mathews T.J. et al. 2000). In 1998, of black, non-Hispanic infants the mortality rate for very low birth weight infants was 270.9 per 1000, 16.8 per 1000 for low birth weight infants, and 4.0 for non-low birth weight infants; among white, non-Hispanic infants the rates were 239.4, 16.4, and 2.4 respectively (ibid). See Table 1. Even though mortality is higher among the lower birth weight infants, the lowest racial disparity is among low birth weight infants and the highest racial disparity is among non-low birth weight infants; the same was found in analysis of the 2000 birth/death linked data sets (Mathews, T.J. et al. 2002). A theory concerning this will be discussed later.

In East Baton Rouge parish, the racial disparity found in infant mortality is higher than that of the nation. In 1996-1998, the infant mortality rate in the white population was 5.0 per 1000 and that of the black population was 17.7, yielding a racial disparity higher than 3.0. The disparity in East Baton Rouge parish is higher than the average of Region 2 in Louisiana. The infant mortality rate among all races in East Baton Rouge parish during these three years was 11.3, higher than the 1998 national rate of 7.2. The percentage of infants born at a low birth weight in East Baton Rouge parish during 1996-1998 was also higher than the nation with percentages being 10.5 and 7.6 respectively. Of the infants born to white mothers, 5.9% were low birth weight while the low birth weight percentage of infants born to black mothers was 15.0 (Louisiana Vital Statistics; Mathews, T.J. et al. 2000).

A note must be made that stillborn infants are not included in the infant mortality rate. In the state of Louisiana, a baby born at 20 weeks or greater gestation which shows

Table 1.1: Birth Weight with Highest Mortality Rates and Ratios--National

	Rate Black (%)	Rate White (%)	Ratio	Mortality Black (1000)	Mortality White (1000)	Ratio
Very low Birthweight	3.2	1.2	2.67	270.9	239.4	1.13
Low Birthweight	13.2	6.6	2.0	16.8	16.4	1.02
Normal Birthweight				4.0	1.8	2.22

no signs of life at the moment of birth, is considered a stillbirth. This is not a clear cut definition because some infants could possibly be resuscitated, but an attempt is not made; therefore, it is considered a stillbirth. Also, the death may occur shortly before delivery, but upon delivery the physician sees signs of life and unsuccessfully attempts to revive the baby thus resulting in the baby being considered an infant death included in the infant mortality rate. Some physicians will not attempt to revive a baby on which no fetal heart tones were present shortly before the actual delivery while some physicians will look for any sign of life so that they feel justified in attempting to get the baby breathing again. Discrepancies such as this have an impact on the infant mortality rate as well as the stillborn rate.

The stillborn rate and reasons for stillbirth are poorly understood and are generally not studied when looking at the infant mortality rate, but it should be. Half of all stillborns occur after 28 weeks gestation, an age at which current technology is capable of helping infants survive, and 20% of all stillbirths occur after a full term gestation of 37 weeks (Copper et al. 1994).

#### 1.4.2 Birthweight Distributions and Differences in Development

Numerous studies have been done investigating infant mortality and the effect low birth weight and prematurity have upon it. Some of the more interesting studies have focused on birth weight distributions. It is common knowledge that black infants are more likely to be low birth weight, but it is less commonly known that black infants across all levels of gestation weigh less than white infants of the same gestation. This has been known for several decades. A study published in 1991 (Hulsey T.C. et al) found that after controlling for certain medical and social conditions, black infants had an

average birth weight of 181 grams less than that of white infants. The disparity was found across all levels of gestation. The gestational age distributions among both races were similar, but the birth weight distribution of white infants was shifted to the right of the curve. The distribution shift was found among both term and preterm infants. The black infants also had a significantly shorter mean length and smaller mean head circumference.

A more comprehensive study on birth weight distributions found similar results. This study used all single live births of 34-42 week gestations born to white and black US-resident mothers during the years 1990-1991 (n=4,360,829) and further broke the population down into categories by race for extremely low risk (ELR) and non-extremely low risk (NELR). Among the 10<sup>th</sup> percentile curve for birth weight, white infants in both the ELR and NELR groups weighed about 150 grams more than black infants in both groups at 38 weeks gestation, 200 grams more at 40 weeks gestation, and 225 grams more at 42 weeks gestation; similar results were also found among the 50<sup>th</sup> percentile curve. It was also reported that the risk of an ELR black mother delivering a small for gestational age was 2.64 times greater than that of an ELR white mother and the risk of infant mortality was 1.61 times greater. But for the ELR group, after controlling for gestational age, the infant mortality rate for both groups at or below the 10<sup>th</sup> percentile for birth weight were essentially identical (Alexander G.R. et al. 1999).

Another study sought an explanation as to why the low birth weight specific neonatal mortality rate for black infants is less than that of white infants even though the overall neonatal mortality rate for black infants is twice that of whites. The researchers found that

“overall, black infants’ gestations are about four days shorter than white infants’. However, after stratifying by birth weight, we found a reversal in our data, namely, LBW (<2500 g) black infants’ gestations are seven days longer than the gestations of LBW white infants. We believe this increased chronological maturity may account for some of the survival advantages of the LBW black infant compared with the LBW white infant of the same weight.” (Mittendorf R et al. 1993)

A possible explanation for the fact that the overall neonatal mortality rate is higher in blacks than whites is that the mean length of pregnancy among black women is shorter than the mean length of pregnancy among white women (Mittendorf R et al. 1999), so the entire population distribution for black women shifts to the left. The black infants are also likely to be smaller.

Earlier it was mentioned that the racial disparity in infant mortality is lowest among VLBW infants and highest among term infants. An explanation for this is that fetal pulmonary surfactant matures more quickly in black infants than white infants, resulting in a lower prevalence of respiratory distress syndrome (RDS) among black infants. Prior to the FDA’s approval of surfactant for clinical use in the treatment of RDS, the mortality rate of VLBW infants was lower for black than white infants. A study, conducted in the St. Louis area, investigated the neonatal mortality of VLBW infants before the approval of surfactant (1987-1989) and after the approval (1990-1991) and found a 41% reduction in the mortality rate of white VLBW infants (from 261.5 per 1000 to 155.5 per 1000  $p=0.003$ ) and no change in the mortality rate of VLBW black infants (195.6 per 1000 to 196.8 per 1000). Prior to the approval of surfactant, the relative risk of death among VLBW black infants as compared to VLBW white infants was 0.7. In 1991-1992, the relative risk was 1.3 ( $p=0.02$ ). Because the fetal pulmonary surfactant of black infants matures faster, black infants are at a reduced risk of

developing RDS syndrome so the surfactant was not as beneficial for them as for white infants. The study found no differences in treatment or access to surfactant (Hamvas A. et al. 1996).

#### 1.4.3 Prenatal Care

Prenatal care is claimed to improve the health of the mother and baby, but not every pregnant woman receives adequate prenatal care. The Healthy People 2010 goal is to increase the proportion of pregnant women who begin prenatal care in the first trimester to 90%. The number of women of all races with no prenatal care in the first trimester has declined over the last two decades; however, black women are more likely to delay entry into prenatal care or receive no prenatal care compared with white women. In 1989, 82.7% of white, non-Hispanic women entered prenatal care in the first trimester compared with 59.9% of black, non-Hispanic women. By 2000, the percentages increased to 88.5 for white, non-Hispanic women and 74.3 for black, non-Hispanic women (Martin J.A. et al. 2002). A decline has also been seen in the number of women receiving no prenatal care. In 1989, 5.2% of black, non-Hispanic women received no prenatal care compared with 1.1% of white, non-Hispanic women. By 1997, the proportions had dropped to 2.9% for black, non-Hispanic and 0.7% for white, non-Hispanic resulting in an absolute decline of 12.4% for black, non-Hispanic women and 5.2% for white, non-Hispanic women (MMWR 2000).

A racial disparity also exists with adequacy of prenatal care utilization. The Adequacy of Prenatal Care Utilization Index (APNCU) is a measure of prenatal care utilization which takes into account both the month prenatal care began and the number of prenatal visits adjusted for gestational age. In 1995, 74.6% of white mothers received

adequate or more than adequate care while 64.4% of black mothers did (U.S. Department of Health and Human Services, 1998).

In East Baton Rouge Parish (EBRP), a large racial disparity exists in prenatal care initiation in the first trimester. During the years 1996-1998, 91.7% of the white women and 69.3% of the black women began receiving prenatal care in the first trimester. During the same years, only 0.36% of the white women received no prenatal care; whereas, 2.4% of the black women did not receive any prenatal care (Louisiana Vital Statistics). During these three years, the white women in EBRP were above the national average for first trimester entry into prenatal care while the black women in EBRP were below the national average. Both racial groups were better than the national average for no prenatal care.

#### 1.4.4 Maternal Mortality

Unfortunately, maternal mortality does not receive as much attention as it should in the maternal and child health field because the majority of the focus is placed on improving the outcome of the infant. It is a poorly known fact that 1982 was the last year the United States witnessed a reduction in the maternal mortality rate—since 1982, the rate has steadily increased. To add to the problem of the increase in maternal mortality is the serious problem of underreporting. The Centers for Disease Control report approximately 350 to 400 official documentations yearly of a maternal death, but believe that the actual number is double or triple the 350-400 (Gaskin I.M. 2002). An example of how a maternal death can not be counted is in the case of hemorrhage. In many cases, hemorrhage is associated with cesarean section; if the cause of death is listed as hemorrhage and the underlying cause of the hemorrhage is not reported on the death

Table 1.2: Parish and National Comparisons for Prenatal Care

	Black Entry in 1 <sup>st</sup> Trimester	White Entry in 1 <sup>st</sup> Trimester	Black No Prenatal Care	White No Prenatal Care
Nation	74.3	88.5	2.9	0.7
EBR Parish	69.3	91.7	2.4	0.36

certificate as a hemorrhage due to a cesarean section, then the maternal death may not be recorded as such. Another is a complication such as a bowel obstruction as the result of a cesarean section that doesn't actually result in death until months later—these are commonly also not reported as a maternal death. Maternal death is defined as a death of a pregnant woman during or within one year after the end of the pregnancy, irrespective of the duration or site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes. The maternal mortality ratio is the number of maternal deaths for every 100,000 live births and includes deaths related to live births, stillbirths, abortion, and ectopic pregnancy.

The official U.S. maternal mortality rate for 1987 was 6.6 per 100,000. A large racial disparity existed in 1987 with the maternal mortality rate for blacks being 14.2 per 100,000 compared to 5.1 per 100,000 for whites (U.S. Department of Health and Human Services, 1991). By 1995 the overall maternal mortality rate had increased to 7.1 per 100,000 and the racial disparity had also increased. The maternal mortality rate for the black population had increased to 22.1 per 100,000 and the rate for the white population had dropped to 4.2 per 100,000—a ratio of over 5:1 (U.S. Department of Health and Hospitals, 1998). However, due to underreporting, the number of maternal deaths is actually higher and the actual racial disparity may be higher or lower. The 1999 maternal mortality rate of 7.7 per 100,000 live birth ranked 21<sup>st</sup> among developed countries and placed the United States among countries such as Slovenia and Portugal. Spain, Norway, and Canada had the best rates with a risk of less half than that of the U.S. (Webber R. 2001).

Maternal mortality is quite different from infant and perinatal mortality. While infant mortality is regarded to be an important measure of a nation's health and a worldwide indicator of health status and social well-being, maternal mortality is a measure of a country's health care delivery system. The fact that the United States' health care system is based on a marketplace model is one possible explanation of why the maternal mortality rate is higher than those of countries with universal health care (ibid). Many states have attempted to expand prenatal care so that more women are eligible, but it has not had a profound effect on maternal mortality. Eugene Leclercq, a maternal health professor at Boston University School of Public Health, states that prenatal care is not enough and that it often focuses on the baby, not the woman. "In the U.S. just a few percent of women get no prenatal care, but that's a major risk factor for maternal death" however, it's not enough because "states decide to provide prenatal care to make sure the mother and baby are healthy, as if that resolves all the lack of care she had before and will continue to have afterwards...It may also say something about how we value women—it seems to say that her main role here is just to deliver the baby. That's shortsighted" (Leclercq E. as quoted in Webber, 2001). Many women who qualify for Medicaid for delivery lose benefits shortly after delivery and are not properly followed after delivery. Not all maternal deaths happen shortly after delivery and if the woman has lost Medicaid benefits then she will most likely be unable to receive the care needed. An example of a maternal death that occurred months after delivery was the case of Nancy Lim, a young mother who contracted an illness during a cesarean section, required a colostomy, and died after eight months of illness (Gaskin I.M., 2002). Many maternal deaths have occurred due to the mother's inability to receive proper follow-up

after delivery even though the baby may still be eligible for Medicaid benefits. Maternal mortality is “a measure not only of what is happening during pregnancy, but as a measure of women’s health before and after pregnancy...Maternal mortality and maternal health is really an indicator of what’s going on during their reproductive years” (Wilcox, as quoted in Webber, 2001).

### 1.5 Reasons for the Racial Disparity

Many reasons for the current racial disparity have been addressed in numerous articles and books. Some of these reasons include

- ❖ More minorities in poverty
- ❖ Health of blacks declines more rapidly
- ❖ More chronic disease
- ❖ Cultural beliefs and responses
- ❖ Racism or prejudice
- ❖ Social environment
- ❖ Changing structure of cities
- ❖ Poor nutrition
- ❖ Unemployment
- ❖ Stress
- ❖ Inadequate housing
- ❖ More female-headed households
- ❖ More HIV/AIDS in black population
- ❖ Lower quality of medical care
- ❖ Lack of knowledge to understand doctors due to lack of education

- ❖ Poor access to medical care
- ❖ Distrust of doctors
- ❖ With prenatal care, no continuity, short visits, and late entry

As previously stated, some reasons for racial disparity may not appear to have a direct impact on maternal and child health, but they do have an effect because they have an effect on the woman during her reproductive years before the pregnancy occurs. A woman who suffered from years of poor nutrition and medical care will not be miraculously cured from this by receiving WIC during the pregnancy and Medicaid-funded prenatal care. The reasons for racial disparities listed above can be grouped into four categories: medical care, overall health, social environment, and prejudice/racism. Medical care and certain socioeconomic factors were also discussed in Section 1.3.

#### 1.5.1 Medical Care

The racial disparity in medical care is without question, but is not a significant factor in the health of pregnant women. Despite the increase in early prenatal care due to Medicaid expansion, the large differences in prenatal care timing and low birth weight still persist. The black to white ratio for low birth weight has actually increased during the period of the Medicaid expansion (Dubay L. et al., 2001). So while the Medicaid expansion can be credited with increasing prenatal care utilization, it cannot be credited with improving outcomes. Why? Because as stated earlier a few months of regularly seeing a doctor is not going to correct years of not regularly seeing a doctor and years of poor living.

One might question this by saying that not all black Americans are dependant on Medicaid and many live in prosperous middle to upper-class neighborhoods. Middle to

upper-class blacks still have disparities in birth outcomes. Studies have shown that infants born to college-educated black women still have a higher preterm delivery, low birth weight, and infant mortality rate than that of infants born to college-educated white women (Schoendorf, K.C. et al., 1992; McGrady, G.A., 1992). One possible explanation for the difference in infant mortality, preterm delivery, and low birth weight found among college-educated black women is the generation effect. The college-educated black women could have spent her childhood in an impoverished environment that will continue to have an effect on her regardless of her current and higher socioeconomic status. In essence, one never escapes their past. As previously stated, women who were low weight themselves at birth are more likely to give birth to a low birth weight infant than someone who was of a normal birth weight (Sanderson et al., 1995). However, it must be noted that the children of the children born to the college-educated black mothers may have a better chance of being healthy weight, full term infants than their mothers did due to the mother's ability to have a healthier lifestyle throughout her entire life.

Racial disparities have been noted in the prenatal care advice received from health providers. After controlling for sociodemographic characteristics, utilization of prenatal care, and medical factors, black women were more likely to report not having received advice from their prenatal care providers about smoking cessation, alcohol use, and breastfeeding (Koagan, M.D. 1994). Medical care alone will not reduce the disparity or the disparity's burden on our society. The social context of health must also be examined.

### 1.5.2 Overall Health

One specific study supported by several others has dealt with what the author describes as the weathering hypothesis. The weathering hypothesis is “that the health of African-American women may begin to deteriorate in early adulthood as a physical consequence of cumulative socioeconomic disadvantage” (Geronimus A.T. 1992) and ties in with the fact that blacks tend to have more chronic disease and that their health tends to decline more rapidly. Geronimus’s study used national linked birth/death files from 1983 and found that while the neonatal mortality rate among whites was highest among teens (7.2) and lower among 20-29 year olds (4.6) and 30-34 year olds (5.6), the same did not hold true for the black population. The neonatal mortality rate was lowest among teens (9.8), higher among 20-29 year olds (10.4), and highest among 30-34 year olds (15.0). The black-white rate ratios were 1.4 among teens, 2.3 among 20-29 year olds, and 2.7 among 30-34 year olds. His findings go against the traditionally accepted belief that teen mothers are more likely to lose an infant, specifically for black teen mothers.

Geronimus offers several suggestions as to why the black neonatal rate increases with the mother’s age rather than decreases, as with the white mothers. His theory is a variant of one first argued by Mosley and Chen (1984). He writes that “the weathering hypothesis encapsulates the ways in which social inequality may affect the health of population groups differentially and the ways in which these differences may be compounded with age.” He goes on to say that the “effects of poverty on child health can be lasting, leaving even those who escape poverty in adulthood at a reproductive disadvantage compared to those who have enjoyed life-long advantages” and that

“Weathering... goes beyond the view that maternal age variables are proxies for social disadvantage to suggest that they be seen as reflections, on a population level, of the ways in which socioeconomic inequality, racial discrimination, or race bias in exposures to environmental hazards may affect differentially the health of women who will become mothers, not only in absolute terms, but also interactively with each other and *increasingly as women age*” (Geronimus 1992).

Geronimus’s belief is that the health status of black women may begin to deteriorate in young adulthood and continues to do so as they enter adulthood and middle age.

The evidence Geronimus used to back his theory is based largely on the fact that black health deteriorates more rapidly than white health and the cultural response. Indicators used for the more rapid decline of black health were the mortality rate, hypertension and blood lead levels. Over the years of age 15-29, fairly predominant childbearing years in the black population, “mortality increases for blacks exceeded those of whites for every death classification we studied” (Geronimus A.T. 1992). With hypertension, no black-white difference were found in the rates at age 15, but by age 25, black women “had twice the odds of being hypertensive, and at the end of the childbearing years, black women had almost four times the odds of suffering from clinically documented chronic hypertensive diseases as whites” ( Geronimus A.T., Andersen H.F., Bound J. 1991; Geronimus A.T. 1992). A larger proportion of black than white women had lead levels greater than 15ug/dL, a level believed to place a fetus at risk. The disparity was found throughout the childbearing years, with a higher disparity as age advanced. The black-white differences were fairly close at age 15, but

by age 25, blacks had twice the blood lead levels as whites, and by the end of the childbearing years, blacks had three times as many with high blood lead levels as whites did (Geronimus A.T. and Hillemeier M.M. 1992; Geronimus A.T. 1992).

### 1.5.3 The Effects of the Social Environment

Cultural explanations for the desires of black women to have their children at a young age are also addressed. Since black women's health deteriorates at a younger age, the norms and expectations may well be for women to have children when they are healthiest and have the greatest amount of social support available. Social support is very critical within the black community for rearing children. Many times, grandparents are actively involved in the care of their grandchildren and if good health in their future is not a certainty, this may have an impact on the children's decision of when to have children. This hypothesis is reached on the "recognition that members of poor communities often have few alternatives but to rely on informal (kin) networks if they are to maximize their ability to find sources of practical support" (Geronimus 1992). The older members of the community may also continue to accept early childbearing so that when they need their children to care for them when their health deteriorates, they are not competing with their grandchildren for support from their adult children.

While it seems to be a generally accepted belief in this country that children born to teenage mothers are disadvantaged in comparison to children born to non-teen mothers, several studies have challenged that notion. One study using a national sample of children aged 3 to 16 years old found that "the lower test scores and increased behavior problems of children born to younger mothers are not due to her age but to her family background" (Turley R.N. 2003). Turley's study also replicated a study by

Geronimus and Korenman (1993) which was controversial. Both studies concluded that maternal family backgrounds accounted for much of the health-related disadvantages of the firstborn infants of teenage mothers. The studies compared sisters who had first births at different ages in order to study the relation between maternal age and low birth weight, prenatal care, smoking and alcohol use during pregnancy, breast feeding, and well-child visits. Both concluded that maternal family background, not age, was the deciding factor in health-related disadvantages. One study went even further to say that “black primiparous women in their twenties may be an important and possibly underemphasized target population for interventions designed to reduce excess black low birth weight and infant mortality rates” (Geronimus A.T. and Korenman S. 1993). And as mentioned previously the infant mortality rate among black, non-Hispanics and the overall racial disparity for infant mortality increases with age, rather than decreases.

Social environment has a profound effect on health. This fact is just beginning to be recognized and accepted. For more than forty years, epidemiologic studies of infant mortality examined characteristics of the mother, such as age, race, education, income, marital status, prenatal care usage, length between pregnancies, and personal behaviors such as cigarette smoking, alcohol use, and drug use. These personal behaviors are unfortunately grossly misrepresented on birth certificates from which this data is drawn. Race is the only “genetic” factor of those listed and race as a genetic factor alone is not the answer to the racial disparities in infant mortality or infant birthweight.

#### 1.5.3.1 The Insignificance of Race as Biological

A study was done to look at genetic factors and its influence on the birth outcome of low birth weight, a leading cause of infant mortality. The 1980-1995 births of three

groups of mothers were studied; the three groups were sub-Saharan African-born blacks, U.S.-born blacks, and U.S.-born whites. If genetics played a role in birth outcomes, then it would be expected that the sub-Saharan born blacks, having the purest racial ancestry, would bear babies with birth weights similar to or lower than that of the U.S.-born blacks. This was not found. The study found the regardless of socioeconomic status, the infants of black women born in Africa weighed more than the infants of U.S.-born black women. In fact, the birth weight distributions of the infants born to sub-Saharan-born women was more closely related to the infants of U.S.-born white mothers than U.S.-born black mothers (David R. and Collins J., 1997). Another similar study analyzed births in New York City between 1988 and 1994 and “found that within the same poor communities, black mothers from Africa and the Caribbean islands were less likely to have low birth weight infants than were white mothers, even after controlling for maternal sociodemographic characteristics” (Kawachi I. and Berkman L.F. 2003).

Another study performed in San Francisco looked at associations between neighborhood factors, maternal race, and preterm delivery, another leading cause of infant mortality that often coincides with low birth weight. The conclusion reached was that “neighborhood factors and changes in neighborhoods over time are related to preterm delivery” (Pickett K.E. et al. 2002). This is significant because it could provide an explanation as to the earlier mentioned studies finding that genetics does not play a role in infant outcome. Race “is social with biological consequences” (Goodman A.H. 2000). It is the social environment that largely causes differences among birth outcomes, not race. Another study on neighborhood risk factors reached a similar conclusion— “individual-level risk factors for low birth weight behaved differently depending upon the

characteristics of the neighborhood of residence” (O’Campo P. et al. 1997). Social environment cannot be ignored when studying racial disparities.

#### 1.5.3.2 The Neighborhood Effect

“The student must clearly recognize that a complete study must not confine itself to the group, but specially notice the environment; the physical environment of the city, sections and houses, the far mightier social environment—the surrounding world of custom, wish, whim, and thought which envelopes this group and powerfully influences its social development.” (DuBois, W.E.B. 1899)

Considering the neighborhood environment is important because individual behaviors cannot be isolated from the social patterns in the area in which the individual lives. Differences in stress, nutrition, exercise, and other health related behaviors have patterns that depend upon the neighborhood’s social and economic situation (Pappas, G. 1994). The social environment of black women in impoverished neighborhoods and black women in middle class or upper class neighborhoods vary, but some characteristics persist in both. Women living in impoverished neighborhoods typically experience feelings of helplessness, inadequate social support, stress due to living conditions, and violence; these are just a few of the negative consequences of poverty stricken neighborhoods. Major stressful life events before and/or during pregnancy have been proven to cause an increase in preterm delivery rates. Also important in the context of major stressful life events is the person’s ability to cope with the stressor (Newton R.W. and Hunt L.P. 1984). Coping is a struggle within many impoverished communities due to lack of availability of proper counseling services and in some cases, lack of structured

social support within the family. While many impoverished families have several generations living within the same residence, this does not guarantee social support in times of crisis or emotional need. Social support during pregnancy has been proven to be beneficial in the prevention of low birth weight (Shiono .H. et al. 1997; Norbeck J.S. et al., 1996; Oakley A., 1985) and preterm delivery. Psychosocial intervention during prenatal care, a form of social support not provided by family members, has also been proven beneficial (Zimmer-Gembeck M.J. and Helfand M. 1996). It was found that “receiving more than 45 minutes of psychosocial services was related to a reduced rate of low birthweight birth for all women regardless of risk profile (Zimmer-Gembeck M.J. and Helfand M. 1996).

Quality of housing in impoverished neighborhoods is a constant concern for many residents. Buildings are in dire need of repair, lack adequate heating and cooling, and empty buildings are quickly turned into “crack houses”. This is a constant source of stress for residents. Beyond the quality of housing and ability to meet the most basic of needs (heat, housing, food) comes the stress of finding employment nearby. Good paying jobs are not readily abundant in impoverished neighborhoods due to businesses moving to the suburbs. Minorities living in the inner-city have been and continue to be vulnerable to structural economic changes as there is a shift from service-oriented jobs to jobs in areas of technological innovations, as well as the relocation of manufacturing industries out of the inner city (Wilson, W.J. 1987). To further complicate the matter, job loss has been greatest in industries with lower educational requirements and lowest in fields that require higher levels of education. There has been an increase in service-oriented jobs which has occurred predominately in the food industry over the last several

decades; however, these jobs have largely concentrated in the suburbs and non-metropolitan areas, geographically distanced from the growing concentrations of urban minorities with low education (Kasarda J.D. 1985). But it goes beyond just being able to meet the most basic of needs. A recent Johns Hopkins study found that “feelings of being stressed and out of control” doubled the risk of premature birth. The key differences showed up not in whether they had enough basic resources to meet their needs but in whether they had some of the extras that can help them feel in control of their lives (Misra D.P., O’Campo P., Strobino D. 2001)

Residential segregation is a pattern of geographic separation that has a bearing on racial disparities in birth outcomes. A highly regarded study published in 1950 found

“that in New York City the rates of nonwhite (African-American and Puerto Rican) and white infant deaths rose as the percentage of nonwhite residents increased. Interestingly, the infant mortality rate of nonwhite infants who resided in predominately white neighborhoods was lower than that of white infants who lived in African-American ghettos. Because of the similar educational and occupational backgrounds of both groups, [it is] suggested that the African-American ghetto environment itself negatively affected infant outcome” (Kawachi I and Berkman L.F. 2003).

Other studies have found relationships between the degree of racial segregation and infant mortality rates. One study found that of the factors studied “racial segregation was the most important predictor of the racial differential in infant mortality rates independent of median family income and poverty prevalence” (Polednak, as quoted from Kawachi I and Berkman L.F. 2003). A similar study previously referenced found that household

class measure at the level of census block group in California served as a better predictor of individual birth outcomes than did the mother's own social class (Krieger, 1991).

Polednak published a subsequent study on trends in infant mortality rates and concluded that "high mortality rates persisted in the most segregated areas and contributed to the widening African-American to white rate ratio" (Polednak, as quoted from Kawachi I and Berkman L.F. 2003).

Segregation from whites is highest for the black population. According to the 2000 census, in the average U.S. metropolis, approximately two-thirds of the black or white population would have to move from their current neighborhood in order to have a completely desegregated metropolis. Black-white segregation has decreased since 1980, but most of the decrease has been in areas with the fewest number of blacks (U.S. Census Bureau, 2003). See Table 3. Table 3 reflects the percentage of persons in each racial minority group that would have to move to a different neighborhood in order to achieve complete desegregation.

Residential segregation is largely based upon race, but also upon income. Poor whites are less likely to live in high poverty neighborhoods than poor blacks. For technical purposes, a high poverty neighborhood is classified as one in which over 40% of residents live in poverty. In 1990, the probability that a poor person would live in a high poverty neighborhood was 6.3% for whites and 33.5% for blacks (Jargowsky P.A. 1997). And among the black population, segregation by class is increasing, (Jargowsky P.A. 1996; Fernandez et al. 1997), meaning that middle class blacks are moving out of the ghetto neighborhoods into what used to be predominately white middle class neighborhoods at the same time that middle class whites are moving out of the same

Table 1.3: Percent of people that would have to move to achieve desegregation

	1980	1990	2000
African Americans	72.7	67.8	64.0
Hispanics	50.2	50.0	50.9
Asian Americans and Pacific Islanders	40.5	41.2	41.1
Native Americans	37.3	36.8	33.3

neighborhoods. African-Americans are considerably more segregated from the white population than any other racial group (Massey D.S. and Denton N.A. 1993).

During the 1940's, 1950's, and 1960's, inner-city neighborhoods had a class integration of lower-, working-, and middle-class professional black families all located in the same neighborhoods. This integration was beneficial because the presence of the working and middle-class families enhanced the social organization of the neighborhoods. During the 1970's, the movement of middle-class blacks, followed later by working-class blacks, left behind a higher concentration of the most disadvantaged groups of the black inner-city population. The phenomenon was described in Chicago during the decade of the 1970's. In Chicago at the time of the 1970 census, eight of Chicago's 77 community areas had poverty rates of at least 30% and only one had a rate of greater than 40%. Over 90% of the residents of these areas were black. From 1970 to the 1980 census, there was a black migration out of these poverty stricken areas of 151,000 persons. This resulted in an increased poverty concentration. Six of the 77 community areas were reclassified in 1980 to an even higher percent concentration of poverty. In 1980, two areas had poverty rates exceeding 50%, nine had rates exceeding 40%, and 14 had rates exceeding 30%. After accounting for the out-migration of the 151,000 blacks, the absolute number of poor households in the original eight communities remained virtually the same (26,940 to 26,259), this supporting the claim that the increase in poverty concentration was largely related to the out-migration of non-poor blacks. The explanation for the increase in the number of communities becoming poverty stricken between the 1970 and 1980 census is that some of the neighborhoods in which the out-migrated blacks moved into became poor due to the out-migration of non-

poor whites and other non-blacks who previously lived in those neighborhoods. During the study period, Chicago did experience an increase in the number of poor people. The number of poor people in Chicago who lived both inside and outside the community poverty areas increased by 24% while the total population decreased 11 percent; therefore, acknowledging the fact that some of the people in these poverty areas did become poor during the study period. This is directly related to the increase in joblessness during the study period (Wilson, W.J. 1987).

The out-migration of middle- and working-class inner-city blacks has effects beyond that of concentrating poverty; it also removes a social buffer. The presence of these families provided a stable role model that helped to keep alive the perception that education is meaningful, steady employment is a better alternative than welfare, and that stability in the family is a norm. Wilson (1987) best sums it up with this quote:

“a perceptive ghetto youngster in a neighborhood that includes a good number of working and professional families may observe increasing joblessness and idleness but he will also witness many individuals regularly going to and from work; he may sense an increase in school dropouts but he can also see a connection between education and meaningful employment; he may detect a growth in single-parent families, but he will also be aware of the presence of many married-couple families; he may notice an increase in welfare dependency, but he can also see a significant number of families that are not on welfare; and he may be cognizant of an increase in crime, but he can recognize that many residents in his neighborhood are not involved in criminal activity.”

The ending effect on neighborhoods after the out-migration is “that joblessness, as a way of life, takes on a different social meaning; the relationship between schooling and post-school employment takes on a different meaning...teachers become frustrated and do not teach and the children do not learn. A vicious cycle is perpetuated through the family, through the community, and through the schools” (Wilson, W.J. 1987). Because of the joblessness, the crime, and the poor schooling, outsiders avoid these areas and the residents remaining behind are isolated to their own way of life which is not the social norm. This social isolation makes it more difficult for those trying to find work because they are not tied to the social network outside of the inner-city; and the isolation also does not generate behavior conducive to good work histories.

Living in these socially depressed inner-city neighborhoods has an effect upon health and life expectancy (Harburg E. et al, 1973; Haan M. et al, 1987) and an altered cultural environment for future generations. This can be described as a culture of poverty resulting from different cultural norms caused by restricted opportunities, poor education, a bleak future, and other negative personal experiences. Neighborhood effects were also discussed in section 1.3.1.

#### 1.5.4 Racism and Prejudice

Racism is a problem which has not gone away. Since many mistake personal prejudice and racism, I will define racism with the following two statements. Racism is the intentional or unintentional use of power to isolate, separate, and exploit others based on a belief in superior racial origin, identity, or supposed racial characteristics. Racism is more than just a personal attitude; it is the systematic or institutional form of that attitude. An individual’s personal prejudice is not racism unless that person also has the power to

apply that personal prejudice; therefore, prejudice and power equals racism. Racism today is predominately institutional and this confuses many because most people were taught to see racism only in individual acts of meanness, not in invisible systems conferring dominance on their group.

Many Americans also feel that the civil rights movement of the 1960's and affirmative action programs have eliminated much of the institutional racism, but they are wrong. Racism is sustained by both personal attitudes and structural forces, and can be overt or invisibly institutional. The most visible sign of racism in this country is in the gross economic inequality between blacks and whites—an inequality that has been widening rather than declining. And “despite landmark court decisions and civil rights legislation, two-thirds of black Americans still suffer from education and housing that is both segregated and inferior. Such conditions, along with diminishing social services, lead to despair” (Wallis J, no date available). The cuts in social service programs, school funding, and government housing assistance are an example of institutional racism because of the personal prejudice and power of some of the people involved in cuts to those programs. Other examples of institutional racism, whether intentional or unintentional, include higher interest rates on car loans or mortgages, realtors with schemes to steer customers away from locations primarily designated for a particular racial group, lower pay, more costly homeowners insurance in “black” neighborhoods, and banks or supermarkets closing branches in poor urban communities (Barndt J. and Ruehle C. 1991). Due to this institutional racism, “people of color (and especially blacks) are disproportionately concentrated among the ranks of the poor, the unemployed,

or those employed in low-paying (and often hazardous) jobs, as well as among people with limited or no health insurance (Krieger N. et al. 1993).

Much research supports the notion that institutional racism is largely responsible for the high levels of segregation of the black population from the white population. The discriminatory practices in the housing market (mortgage redlining, racial “steering”) are argued to be the leading cause of the segregation (Massey D. and Denton D.H. 1993; Meyer S.G. 2000; Munnell A.H. et al. 1996). One study found that 20% of potential African-American homebuyers were treated unfavorably compared to whites (Turner M.A. and Skidmore F. 2001).

Racism is also a problem which adversely affects psychological well-being for blacks (Williams D.R. and Harris-Reid M. 1999) and unfortunately, few studies are being done to investigate the effects of racism on health. The majority of the studies on race and health deal with the concern of racial disparities in health, not the health consequences of racial subordination. The lack of studies on the psychological effects of racism/personal prejudice does not allow for an accurate representation of the severity of psychological harm that occurs after years of being “suspected of cheating and thievery, suffer[ing] rude service at public accommodations and restaurants, encounter[ing] hate stares and racial epithets from strangers on the street, and [being] treated unfairly by law enforcement and other government officials” (Krieger N. et al. 1993). Continuous psychological insults can weaken one’s ability to respond to factors that have a negative affect on health and can lead to depression, substance abuse, and unemployment. For pregnant women, the risks are severe because a large body of literature associates psychological/psychosocial stress to negative birth outcomes. Stress and the coping

measure employed have an affect on the woman's ability to carry a pregnancy to term. To further complicate this, all of the woman's coping responses "must be viewed within the context of the woman's environment: how the insult was delivered, how the woman perceived it, and what protection she had at the time of the insult" (Rowley D.L. et al. 1993). This relates back to the woman's social environment or neighborhood environment and the personal relationships she has developed within that neighborhood.

An association has been found between the experience and internalization of racial discrimination and hypertension in black women and a subsequent effect on perinatal outcomes. One study of black and white women and their experiences of race and gender discrimination found that hypertension in black women who were exposed to racial discrimination and did not respond to the discrimination had hypertension rates of 4.4 times higher than those who took action against the racial discrimination. No association was found among white women because very few reported race-biased treatment (David R.J. and Collins J.W. 1991). Another study went farther to report that darker-skinned black individuals who were also of higher class status reported more hypertension than light-skinned black individuals among higher class status and darker-skinned black individuals who were among lower class status. The darker-skinned/high social class experienced and/or internalized more racism than the lighter-skinned/high social class or darker-skinned/lower social class (Dressler W.W. 1991).

Studies have also found that black women who feel the stress associated with racism were more likely to deliver low birth weight babies. Researchers of a study found that 50% of black women who had preterm deliveries and 61% of those with low birth weight infants reported racial discrimination experiences in at least three situations. A

second study found that women who reported discrimination in at least three situations were 2.6 times more likely to deliver very low birth weight infants as those who did not experience discrimination (kaisernetwork.org, 2004). It is believed that the stress of discrimination can cause an increase in blood pressure and the release of a corticotropin hormone which is associated with preterm deliveries. The stress can also result in a weakening of the immune system thus allowing for vaginal bacterial infections, also proven to be a risk for preterm delivery. Basic prenatal care alone is not going to help black women cope with the stress of discrimination; rather the health care provider should discuss coping measures with their patients or organize support groups for black women.

In summary, racism affects the health of blacks in at least three ways. The first is that it transforms social status so that socioeconomic indicators are not equivalent across races; related to this are the differences in the quality of elementary and high school education between races. The second is that racism can restrict access to the quantity and quality of health-related services such as health care, housing, and recreational facilities. Last is that the experience of racism can induce stressors that adversely affect physical and mental health status (Williams D.R. and Collins C. 1994). More studies need to be conducted on the effects of racism on the health of the black population.

## 1.6 The Future

Progress in the area of racial disparities will continue to be slow and tedious work. The main reason for the slow progress will be the need to tackle difficult social, economic, cultural, and political issues. Medicaid funding, a vital source of coverage for many black citizens, has been stricken with budget cuts in nearly every state. But as

stated earlier, access to medical care is not a sole solution to this complicated problem. Programs such as Healthy Start are diligently working towards the reduction of racial disparities in birth outcomes, but are hindered by tight budgets and only having a short period of time to attempt to correct years of substandard life experiences.

Numerous studies conducted on the topic of reducing racial disparities in health give suggestions as to what should be done to reduce racial disparities, but these suggestions are typically not achievable. For example, one study said that in order to reduce racial disparities in infant mortality “public health professionals must refocus the public’s attention on assuring that all women are provided adequate education and services to help them avoid unintended pregnancies, that all pregnant women receive services in appropriate facilities, and that the causes of preterm delivery are discovered” (Rowland Hogue C.J. and Vasquez C. 2002). The authors did not provide an action plan to accommodate the change because there is no effective action plan. While researchers have discovered numerous causes of preterm delivery, no one has developed an effective strategy to actually prevent preterm delivery; and in the mean time, preterm delivery is on the increase in the country—opposite the direction we desperately need to go. Avoiding unintentional pregnancies and ensuring all pregnant women receive adequate prenatal care are other goals that no one effectively knows how to accomplish. Medicaid has been extended to include more pregnant women than ever but it has not improved outcomes, nor has it actually improved the quality of care received.

Changing the current racial disparity is going to be a challenge on the same difficulty level as eliminating poverty. Change will not come easily or quickly. Change will have to occur one person at a time and after much fine-tuning of existing programs,

both nationally and at the community level. Two such community programs that have been successful in changing the lives of residents are the Computers in the Classroom initiative in Mississippi and an initiative by the Mar Vista Family Center in West Los Angeles. The Computers in the Classroom initiative in Mississippi is fighting poverty, a factor related to racial disparities in health. The program trains teachers in educating students about repairing, upgrading, and building computers, and in the process has provided student graduates of the program the exposure needed to pursue careers in computer science and computer repair. The Mar Vista Family Center focuses on the problem of poverty by interacting with low-income parents and children to help develop nurturing environments so that children have the skills to succeed later in life (Dean H. 2003).

The future challenge of eliminating racial disparities and how long it will take can best be summed up with this phrase from J.F. Kennedy—“Our work may not be finished in the next few months or the next few years or perhaps in our lifetimes. But for the sake of our United States and all who dream of living out its promise, let us begin—one face and one community at a time.”

## Chapter 2: Challenges of Studying Socioeconomic and Neighborhood Effects on Health

### 2.1 Introduction to Multilevel Analysis

Several challenges arise while studying the effects of the “neighborhood environment” on the effects of a person’s or a population’s health. Some of the challenges occur because of, for example, inaccuracies in the actual birth or death certificate records or underreporting in the decennial census. Other challenges arise by simultaneously using individual level data, such as the birth and death certificates, and aggregate/population level data, such as the census records. Multilevel analysis is the technique that allows researchers to study both the individual and aggregate level data to determine effects of the social/neighborhood environment on the health of residents in the area. The individual level data is “supplemented” with social class measures derived from a very easily obtained source of socioeconomic data at a community level, the US census (Krieger, N. 1992). The individuals are placed into the right geographic area by their residential address.

The use of multilevel analysis/multilevel modeling has been tested over many years and has become an accepted and proven form of analysis. Prior to the use of multilevel analysis, epidemiological investigations were based upon the person’s individual risks provided by data sources such as birth and death certificates with a significant drawback being that consideration of social/neighborhood factors on the health of the individual were not included as a potential causal factor. The failure of these individual-level records to include crucial socioeconomic data halted efforts to understand, monitor, and address social and racial disparities in health because the belief was that the lifestyle and behavior choices of individuals mattered more in terms of

causation than the effect of the geographic area and social standards in which one lived (Diez-Roux, A.V. 1998). Ignoring the role of the accepted behavioral norms of the neighborhood and the neighborhood effects lead to an incomplete understanding of disease/health determinants in individuals and populations. During the 1990's, much more emphasis was placed on the social environment's impact on a person's health and many studies investigating the health differences among like people that resided in different "neighborhoods" were published. Some of these studies and their use of multilevel analysis will be discussed in a following section, and a discussion of how the neighborhood environment can have an impact upon an individual's health was discussed in the first chapter.

Studies have found many associations between place of residence and individual health outcomes. Living in areas of high poverty has an effect on the individual-level risk of single parenthood (Massey, D.S., Gross, A.H., and Eggers, M.L. 1991). Neighborhood environment has also been found to have an effect upon an individual's mortality risk (Lochner, K. et al. 2001; Subramanian, S.V. et al. 2005), exposure to violent crime (Sampson, R.J., Raudenbush, S.W., and Earls, F. 1997; Sampson, R.J., Morenoff, J.D., and Raudenbush, S. 2005), child development (Levnethal, T and Brooks-Gunn, J. 2000; Brooks-Gunn, J, et al. 1993), childbearing practices (Hogan, D.P. and Kitagawa, E.M. 1985), domestic violence (O'Campo, P. et al. 1995), and health behaviors such as smoking, consumption of alcohol and dietary fat, the use of seatbelts (Diehr, P. et al. 1993), and depression (Yen, I.H. and Kaplan, G.A. 1999). A large multilevel study found neighborhood effects on numerous health indicators, such as childhood lead poisoning, gonorrhea, syphilis, chlamydia, tuberculosis, HIV/AIDS

mortality, homicide, low birthweight, nonfatal firearms-related injury, premature mortality, lung and cervical cancer incidence, and diabetes mortality (Krieger, N. et al. 2005). The neighborhood environment was also shown to modify the effects of maternal educational attainment on the risk of infant diarrhea (Dargent-Molin, P. et al. 1994). Modifying the community effect can result in a change in the health of individuals living in the area.

Group-level variables are crucial to include in analysis because they represent factors not captured by individual level data. The average income of a neighborhood can act as a marker for neighborhood-level factors related to health by the presence or absence of recreational facilities, parks, large supermarkets, and environmental hazards that will affect everyone in the community regardless of how much income that specific household brings in.

Analysis using both individual and aggregate/macro-level data has several advantages over more traditional methods. Multilevel analysis is more consistent with social theories than traditional single level analyses because they accommodate multiple levels of data. Multilevel analysis bridges the micro-macro gap and increases our understanding of how certain factors result in differences in individual level risks therefore increasing our understanding of public health issues. Multilevel analysis also can help to explain and eliminate confounding of individual level models that always omit the aggregate levels factors of the neighborhood environment. By understanding how these aggregate level factors affect individual health, intervention strategies can be better planned and implemented (O'Campo, P. et al. 1997; Subramanian, S.V. et al. 2003).

## 2.2 Overcoming the Obstacles of Validity, Ecological Fallacy, and Other Challenges

Multilevel studies have a distinct advantage over ecological studies in that they can determine whether differences across areas are due to differences in the areas themselves or differences between the types of people living in different areas. Multilevel studies can also evaluate the role of confounders and modifiers of effect. Multilevel studies can differentiate the effects of context (neighborhood characteristics) and composition (individual characteristics). Multilevel analysis simultaneously includes group and individual level variables in regression analysis, thus allowing for controlling of potential confounders and also to allow for analysis of within-and between-neighborhood variability in outcomes and to what extent the individual or group factors play in the variability. This is also why multilevel studies can be more challenging to conduct with regard to fallacies and confounding.

The most commonly discussed fallacy is the ecological fallacy. Fallacies result from drawing inferences at one level of aggregation based upon data at another level. Ecological fallacy is drawing inferences at the individual level because of group level data; whereas, symmetrical fallacy (also called individualistic or atomistic fallacy) results from drawing inferences at the group level based upon individual-level data. The two primary sources of ecological fallacy are the absences of information on individual-level confounders or effect modifiers, which could vary from group to group and the presence of contextual effects of derived variables which essentially is placing a larger effect from the aggregate measure than the individual measure (Diez-Roux, A.V. 1998). Both of these fallacies can be avoided by using multilevel analysis because both individual and

group level data are included in the evaluation and also by ensuring that appropriate inferences are made.

Two other fallacies that should be considered while doing multilevel analysis are the psychologistic fallacy and the sociologistic fallacy. Psychologistic fallacy is ignoring or leaving out relevant group-level variables in a study of individual level associations and sociologistic fallacy is leaving out relevant individual-level factors when studying groups. Both of these types of fallacies can be thought of as sources of confounding by leaving out relevant variables in the statistical testing model. This is a concern in multilevel modeling because the group level effect may actually be the result of a related/predictive individual-level variable being omitted; however, omission of relevant/causal variables in a predictive model is a problem in all epidemiological studies regardless of whether the study is individual-level, group-level, or a combination of both. In multilevel analysis, if certain individual-level variables are omitted from the model, then the result is a confounded estimate of the group-level effect, but if there is an overcontrolling of potential confounding variables in the model, then the group-level effect can disappear and wrongfully lead to an assumption in the other direction. Controlling for potential confounders is also a problem in individual-level studies as too many, too few, or the wrong ones may be placed into the regression model. The new dimension for confounding in multilevel analysis is confounding at the group-level by omitting variables, and also by overcontrolling. Multilevel analysis requires that potential confounders/variables on both the individual- and group-level be appropriately placed in the model (Diez-Roux, A.V. 2001; Diez-Roux, A.V. 1998). Variables can be stratified on levels, such as social position, to respond to the issue of confounding (Rauh,

V., Andrews, H., and Garfinkel, R. 2001; Pearl, M., Braveman, P., and Abrams, B. 2001).

Multicollinearity is also a problem that can arise. Certain predictors are so interrelated and correlated that it is very difficult to separate the effects of these variables statistically. Few studies using multilevel analysis discuss the issue of multicollinearity because, depending upon the specific research question, it is not meaningful enough to deal with the challenges of separating their individual effects (Diex-Roux, A.V. 1998).

It is important to keep in mind that the definition of the term “neighborhood” can and will vary between studies. Some studies try to incorporate the accepted notion of a neighborhood, while others use school districts, fire districts, census block groups, or census tracts as their definition of a neighborhood. There is not an accepted standard as to what a neighborhood should be as it will vary depending on the purpose of the study. If the study is on crime, then accepted police districts could be an acceptable “neighborhood” area; whereas, if the study is on the best location to place a free-care hospital or clinic, then police districts would not be an appropriate choice for neighborhood boundaries. What is important to consider in determining the area used to represent neighborhood is that the people in the area are alike in terms of what is being studied. Many studies are on the social impact of residential segregation and poverty, so census block group or census tract is a common use of the term neighborhood for these studies on social/socioeconomic factors. An added benefit to using census areas is that census block groups and census tracts include homogeneous populations and sometimes are changed in a new census to ensure that they contain groups of like people. The census tract is also a unit used by federal, state, and local agencies to determine eligibility

into programs for real life purposes such as medically underserved populations and qualified census tracts for low-income housing tax credits (Krieger, N. et al. 2005). Census tracts typically contain around 4000 people while census block groups typically contain around 1000 people. Ideally, the neighborhood areas should contain enough people and enough actual neighborhoods to allow determination of within- and between-area variability in the outcomes associated with them.

Another challenge is that neighborhoods are always in a state of flux. People in the neighborhood can go from a state of poverty to one of not and the census collects what they were at that moment. Mobility is also a concern, but most people who move to another neighborhood most likely move to another neighborhood of similar socioeconomic status. So while the census data collected may only capture a moment in time, it is a generally accurate representation of the neighborhood at that moment (Krieger, N. 1992; Diex-Roux, A.V., 2001).

The most challenging aspect of multilevel analysis is that, due to the integration of macro- and micro-level variables, a theory of causation must contain and explain the interactions between the levels; ie, how do individuals interact with the neighborhood environment. Most likely, the neighborhood and individual characteristics mutually affect each other; for example, nutrition is poor in individuals because there is a poor availability of quality foods in the grocery stores around the neighborhood (Diex-Roux, A.V., 2001). An excellent example of how individual choice interacts with the social environment/norms is with fertility. It is an individual's choice of when they have a child, but if it is socially acceptable in the social environment/neighborhood to wait until the late 30's, the "social norm" may persuade them to wait; and, if enough women follow

the social norm, social change will not occur. These methodological issues pertaining to multilevel analysis are still not completely worked out, but the methodology available as it is now has been used and tested in many studies and proven to be effective and useful.

### 2.3 The Use of Multilevel Analysis on Reproductive Outcomes

For the most part, studies on reproductive outcomes have largely been focused on the individual characteristics of women rather than the social and environmental conditions that also play a role in those outcomes. It is well known that certain racial groups and mothers with certain individual characteristics are more likely to have a low birthweight baby, but less is known about why rates of low birthweight, for example, are higher in cities than in the suburbs and why the largest cities also have the highest rates of low birthweight, especially among the black, non-Hispanic population (Ahmed, F. 1989). This can partly be explained because the black, non-Hispanic population differ by degree of racial segregation, which in highly segregated areas, is characterized by concentrated poverty, inadequate health care, crime, and other stressors (Polednak, A.P. 1997). Another consideration in the neighborhood's affect on reproductive outcomes is how long the woman has lived in that area. Black, non-Hispanic women who were born outside the United States and moved here have better reproductive outcomes than black, non-Hispanic women born in the United States, regardless of where they currently live (David R and Collins J. 1997; Cabral, H, et al. 1990).

Some neighborhoods dramatically differ from the accepted cultural norms or standards of most other neighborhoods. These areas are those in which the relatively new urban underclass resides. The urban underclass is marked by concentrated poverty, social dislocation from the rest of society, racial segregation, extreme economic segregation,

and norms that are drastically different from the rest of society (Wilson, W. J. 1987). These areas are also different in terms of collective efficacy which is defined as “social cohesion among neighbors combined with their willingness to intervene on behalf of the common good” (Sampson, R.J., Raudenbush, S.W., and Earls, F. 1997).

Studies evaluating the effect of the neighborhood on reproductive outcomes have concluded a range of effect that the neighborhood has on reproductive outcomes. The range is from slightly detectable to a great significance (Pearl, M, Braveman, P, and Abrams, B. 2001; Rauh, V, Andrews, H, and Garfinkel, R. 2001; Roberts, E. 1997, O’Campo, P. et al. 1997; Pickett, K.E. et al. 2002; Wasserman, C.R. et al. 1998; Schiono, P.H. et al. 1997). A study performed in Chicago studying the effects of the social environment on the distribution of low birthweight found that at the societal level, social stratification has an impact on resources available to pregnant women. The study also found that some neighborhoods are more concerned with the health of their residents and mobilize to distribute and assist with resources related to maternal health as a result of collective efficacy in that particular neighborhood (Roberts, E., 1997; Sampson, R.J., Raudenbush, S.W., and Earls, F. 1997). Roberts’ study places an emphasis on support networks available to women in the community, a more common occurrence in African-American neighborhoods. The women in more isolated communities, whether by distance or by self-sufficiency were more likely to have a higher rate of low birthweight. A second point in Roberts study that deserves mentioning is the attention placed to understanding that, while certain characteristics, specifically, economic hardship, can appear to be one on an individual level, broader interpretation is needed. Economic hardship in a neighborhood is more than just a characteristic that can be interpreted at an

individual level because poverty and unemployment serves to undermine the cultural standards of the entire community and once cultural standards begin to deteriorate, entire families are destabilized and the support network systems are eroded.

Individual risk factors have been shown to interact with aggregate-level variables thus causing individual-level risk factors to behave differently depending upon the neighborhood of residence (O'Campo, P. et al. 1997). The study went on to elaborate on this statement with the example of prenatal care. Women residing in high risk neighborhoods (high unemployment and poverty) benefited less from prenatal care received than those not living in high risk neighborhoods. The researchers found that as unemployment in the area increased, the protective effect of initiating prenatal care early in the pregnancy diminishes.

Neural tube defects are also found to have an association with neighborhood indicators. Neighborhood social conditions affect the probability of neural tube defects as much as or more than individual-level variables, and women of lower socioeconomic status who also resided in worse neighborhood conditions were at an increased risk of neural tube defects, with an adjusted odds ration ranging from 1.5 to 2.4. The risk also was found to increase over a gradient of low socioeconomic indicators (Wasserman, C.R. et al. 1998).

A study on the effects of maternal age and neighborhood to racial disparities in birthweight found that a significant main effect of community poverty on low birthweight among African-American women after controlling for various individual level effects (Rauh, V, Andrews, H, and Garfinkel, R. 2001). The rates of low birthweight among African-American women were higher in poor communities; however, community

poverty did not play a role in any differences in birthweight among white women. The study also found that individual poverty also increased the risk of the effect of advanced maternal age on low birthweight. The finding of the effect of poverty at both an individual and community level is significant because individual poverty or wealth is somewhat unreliable and subject to change over short periods of time; whereas, community poverty conditions change more slowly and thus provide a more consistent and constant influence on individual health.

Another study on the effects of neighborhoods on birthweight in different ethnic groups also found that neighborhood environment had a more profound impact on African-Americans than whites. In the study, birthweight declined among black residents in a linear fashion as neighborhood socioeconomic status lowered, but this occurrence was not found among whites (Pearl, M, Braveman, P, and Abrams, B. 2001). The study also reported that to a certain degree, census variables can be used as a substitute for social environments not commonly found on medical records. Neighborhood socioeconomic effects on the risk of preterm delivery also vary by race with African-Americans experiencing higher rates of preterm delivery than whites (Pickett, K.E. et al. 2002).

Living in an impoverished neighborhood can have an effect on individuals within the neighborhood. Living in an impoverished neighborhood can increase feelings of helplessness and loss of control over oneself. The mobility of impoverished persons is rather high and this can lead to a feeling of being out of control and feeling that chance and luck (or lack thereof) play a major role in one's health (Schiono, P.H. et al. 1997). Women who felt that chance played a major role in health experienced a decrease in

birthweight of their infants. And while mobility and chance exhibit a negative effect on birthweight, living in the same residence for at least three years regardless of how impoverished the neighborhood is, is associated with an increase in birthweight of the infant due most likely to social support systems (ibid). Different neighborhood factors can also play distinct roles in low birthweight and preterm delivery. Certain stressors felt by residents in the neighborhood may contribute to the early onset of labor and result in preterm delivery, while other accepted negative health behaviors such as maternal smoking being accepted can contribute to low birthweight infants (Pickett, K.E. et al. 2002). Changes in neighborhoods over time, such as rapid mobility, has also been proven to have an effect on the reproductive outcomes of residents (ibid).

#### 2.4 Why the Neighborhood Effect is Greater Among African-Americans

What several of these multilevel studies tell us about neighborhoods and African-Americans is that the neighborhood has a more significant effect on them than on whites. The neighborhood differences between African-Americans and whites was briefly discussed in Chapter 1, but will again be discussed. While studying racial differences in health, it is important to keep in mind that the aggregate and neighborhood measures vary in how they affect those of different race and ethnicity, and can also have an impact on individual outcomes.

At this point I want to make reference once again to the study comparing the birthweights of infant born to sub-Saharan African-born black women, US-born black women, and US-born white women. The study found that the sub-Saharan African-born women, the purest racial ancestry, had infants with birthweights more comparable to those of the US-born white women than the US-born black women. This finding rules

out the thought that genetics plays a significant role in the racial disparities of birthweight, thus requiring more consideration to fall on the neighborhoods and where and how the US-born black women live (David, R. and Collins, J. 1997).

Black women of all socioeconomic classes have poorer birth outcomes in comparison to white women of the same socioeconomic status. But the reasons for the difference in birth outcomes vary by class. Black women of the middle- and upper-class are more likely to live in less racially segregated neighborhoods and have better access to large grocery stores with better nutritional options, higher paying jobs, better housing, and better schools for their children; however, they are also more likely to experience individual racism and prejudice than black women living in racially segregated neighborhoods. Racism among the middle- and upper-classes is different from those of the lower-class in that it more of a psychological distress from more personally-aimed instances of racism (Williams, D.R. and Collins, C. 1995).

Racism and personal prejudice can also be found in surveys of the public's perception on race and poverty. The public has an exaggerated estimate on the proportion of blacks living in poverty. One national survey found that when the public was asked if there were more blacks or whites in this country who were poor, over half responded more blacks were poor; many responded that over 50% of the poor in this country are blacks. The people who have an incorrect representation of poverty in this country are also those most likely to oppose welfare. To add to these inaccurate representations, many Americans also feel that the black population is "lazy". When asked to rank the black population on a 7-point scale from lazy (1) to hard-working (7), 47% of whites placed blacks on the lazy side of the scale. The inaccurate representation

of who is in poverty coupled with the perception of blacks being lazy only serves to reinforce racial stereotypes, a major underlying of racism/personal prejudice (Gilens, M. 2004).

The media contributes to these stereotypes in the way they portray the black and white populations. Residents surveyed in the states of Idaho, Montana, Wyoming, North Dakota, South Dakota, and Utah responded that 47% of all poor people in the country were black when in their states of residence blacks make up only 1% of the poor population. Since these respondents do not have personal experience with poor black people, it can be thought that the media influence plays a role in their belief in racial stereotypes. These types of racial stereotype impact the health of the black population in differing ways; none of which are positive (Gilens, M. 2004). This type of stereotype can have an impact on the continued racial segregation of the American population—as middle-class black families move in to what was predominately middle-class white neighborhoods, the white population reacts based upon stereotypes and begin to move out, resulting in further residential segregation by race and socioeconomic status (also known as racial resegregation). Racial stereotypes can also contribute to internalized racism, in which, the stigmatized race accepts these negative messages about their self-worth thus leading to self-devaluation, resignation, and helplessness (Fogel, J. 2005)

Racism also affects those of the lower-class. Members of the lower-class suffer poorer health outcomes largely because of the effects of residential segregation, concentration of poverty, and poor neighborhood conditions. In the United States, race is a stronger force towards the segregation of neighborhoods than socioeconomic status (Kawachi I and Berkman L.F. 2003). Urban inner-city areas tend to be the most

segregated of all, with more than one dimension of segregation affecting the residents. Urban inner-city blacks tend to live in hypersegregated areas. Hypersegregated areas tend to be segregated in co-existing, multiple dimensions of unevenness, isolation, clustering, centralization, and concentration (see Appendix A for definitions).

Residential segregation works to concentrate poverty among these areas. High poverty in black, inner-city neighborhoods creates a very disadvantaged social environment, and the social environment has a influence in health outcomes. “Residing in a very low-income urban neighborhood is such a strong proxy of low birthweight for Blacks that traditional indicators of favorable outcome (education, age, marital status) fail to identify clearly a low risk subgroup. The intense concentration of extreme poverty, combined with the related issues of disintegrating social networks, substance abuse, poor nutrition, smoking, and inadequate prenatal care, may produce such a powerful negative force that isolated changes in the classical risk factors do not dramatically reduce the high percentage of low birthweight infants....We suspect that the persistently high rate of low birthweight infants among Blacks reflects generations of poverty” (Collins, J.W. and David, R.J. 1990). Even the black population that does not live in poverty-stricken, inner-city areas suffer from segregation. Blacks living in the suburbs are typically segregated in areas characterized by lower income and higher crime rates than their white peers (Alba, R. et al. 1994).

## 2.5 Birth Certificates: How Accurate Are They?

Several studies have been conducted to determine how accurate information reported on the birth certificate actually is. Most of these studies compared the birth certificate record to a matched hospital record and one study has matched the birth

certificate record to the record in the case file of Healthy Start clients. In all studies, the medical records/Healthy Start records were considered the “gold standard”. Accuracy of the information on the birth certificate varies drastically with certain variables being found consistently accurate and other being consistently inaccurate. One study found that, while pooling medical records from several hospitals, the accuracy varied upon the hospital of delivery (Parrish, K.M. et al. 1993).

The most consistently accurate recording on the birth certificate is the infant’s birthweight (Reichmann, N.E. and Hade, E.M., 2001; Roohan, P.J. et al., 2003; Piper, J.M. et al., 1993; Bueschner, P.A. et al., 1993), Apgar scores (Piper, J.M. et al., 1993; Bueschner, P.A. et al., 1993), and demographics of the mother (Reichmann, N.E. and Hade, E.M., 2001; Piper, J.M. et al., 1993). The study conducted in New York state reported 100% sensitivity and specificity for birth weight accuracy on the birth certificate (Roohan, P.J. et al., 2003). The North Carolina study found 100% agreement between the two sources of information for the fields of birthweight and Apgar scores (Bueschner, P.A. et al., 1993). The other studies found agreement >90% of the time between the birth certificate and the compared record for demographics, birthweight, and Apgar scores.

Higher levels of agreement were found for type of delivery, especially cesarean section versus vaginal delivery (Reichmann, N.E. and Hade, E.M., 2001; Roohan, P.J. et al., 2003; Parrish, K.M. et al. 1993; Piper, J.M. et al., 1993; Bueschner, P.A. et al., 1993), but the accuracy between records was lower for forceps/vacuum delivery in conjunction with a vaginal delivery (Parrish, K.M. et al. 1993; Piper, J.M. et al., 1993; Bueschner, P.A. et al., 1993) and VBAC (vaginal birth after cesarean) (Parrish, K.M. et al. 1993; Piper, J.M. et al., 1993). The Washington state study found agreement between

the birth certificate record and the medical record for VBAC and forceps/vacuum delivery 70% of the time and for cesarean delivery 84% of the time (Parrish, K.M. et al. 1993). VBAC reporting on the birth certificate in the Tennessee study has a very low sensitivity (below 50%) and only moderate sensitivity for forceps delivery (Piper, J.M. et al., 1993). The explanation for the low reporting of VBAC and forceps/vacuum delivery is that in the checkboxes under method of delivery, vaginal delivery is checked but the second checkbox of VBAC or forceps/vacuum is neglected (Bueschner, P.A. et al., 1993). With so much emphasis being placed on increasing the percentage of women undergoing VBAC, this information of incorrect reporting on the birth certificate is very disheartening since researchers default to using birth certificate records in surveillance of perinatal/reproductive outcomes. Birth certificate records are used for determination of local, state, and national progress towards the Healthy People 2010 objectives, of which cesarean section and VBAC are included.

Maternal weight gain during pregnancy is another variable found to have discrepancies between the medical record and the birth certificate. One study found a 77% match between the two records (Reichman, N.E. and Hade, E.M., 2001) and another found an 83% matching between records (Bueschner, P.A. et al., 1993). Another study found that only 41.6% of the reported values provided for gestational age matched between the two data sources (Piper, J.M. et al., 1993). Reported tobacco and alcohol usage also varied. Two studies evaluated the consistency reported either low or moderate matching for tobacco and alcohol usage (Piper, J.M. et al., 1993; Buescher, P.A. et al., 1993). The “gold standard” of hospital records however, probably was not an accurate representation of true alcohol/tobacco usage because these depend upon the pregnant

woman admitting to using these substances, and many pregnant women do not do so because of concern of being treated harshly by medical staff.

Discrepancies in prenatal care initiation and number of visits were commonly found in studies on the accuracy of birth certificate records. The Tennessee study found that the total number of prenatal care visits between the two sources matched only 27% of the time and the month of prenatal care initiation matched only 32% of the time. In both reportable measures of prenatal care, usage was over-reported on the birth certificate (Piper, J.M. et al., 1993). A second study also found major discrepancies in reporting with the number of prenatal care visits being correct only 70% of the time and number of total visits being correct only 38% of the time. The accuracy of the match between the two records improved when the visits were coded as +/-1 (59%), and to 70% when the visits were +/-2 (Roohan, P.J. et al. 2003). This is not very impressive when considering that a lack of two prenatal visits could represent a 2-month delay in prenatal care (in the earlier stage of pregnancy visits only occur once a month). As in the first study, prenatal care usage in this study was overstated on the birth certificate record. A third study also found inaccuracies between the birth certificate and medical records though the discrepancy was not as profound as the previous studies. The study found that month of initiation of prenatal care matched 79% of the time and number of prenatal care visits matched 82% of the time. This study also reported that prenatal care usage was overstated on the birth certificate (Beuscher, P.A. et al., 1993) as did a study conducted in New Jersey which used Healthy Start records as it's "gold standard" (Reichman, N.E. and Hade, E.M., 2001). I found only one study which found that the medical records overstated prenatal care usage when compared to the birth certificate records (Dobie,

S.A. et al., 1998) These discrepancies in prenatal care usage need to be considered and acknowledged by many public health agencies. Increasing the number of prenatal care visits and ensuring that women begin prenatal care early in pregnancy are some of the 2010 initiatives established by the CDC. Inaccuracies such as this only provide an inaccurate representation to base our goals and standards on.

Not surprisingly, many discrepancies were reported in the categories of maternal medical risk factors, complications of labor and delivery, obstetric procedures, maternal and/or infant transfers, and abnormal conditions of the newborn/congenital anomalies. Two studies which provided the sensitivity of reporting on the birth certificate reported wide ranges varying from 0% to 100% depending upon the maternal medical risk factor. Sensitivity for the high-risk predictive variable of previous low birthweight infant was only 27% in one study (Roohan, P.J. et al., 2003) and 10.74% in another (Reichman, N.E. and Hade, E.M., 2001). Of the 16 medical risk factors listed in the Roohan study (2003), only diabetes (42%) had a sensitivity of reporting over 21%. The study by Reichman and Hade (2001) had higher sensitivities for risk factors with about half of the listed 26 risk factors being above 50%. Many of these risk factors such as heart disease, chronic hypertension, chronic lung disease, previous spontaneous fetal death, and eclampsia can be severe and are commonly used to determine high-risk status of pregnant women (high risk status is a common exclusion in many studies on birth outcomes). Three other studies also found that medical risk factors were underreported on birth certificates (Dobie, S.A. et al, 1998; Beuscher, P.A. et al. 1993; MacKay, A.P. 2002).

Reporting of complications of labor and delivery and obstetric procedures was also found to be grossly inaccurate and under-reported on birth certificates. Some

significant complications that had low sensitivities (generally below 50%) and disparities in the accuracy between the records were placenta previa, placental abruption, fetal distress, meconium, precipitous/prolonged/dysfunctional labor, breech/malpresentation, cord prolapse, episiotomy, ultrasound, amniocentesis, induction/stimulation of labor, and cephalopelvic disproportion (Reichmann, N.E. and Hade, E.M., 2001; Roohan, P.J. et al., 2003; Dobie, S.A. et al., 1998; Parrish, K.M. et al., 1993; Dobie, S.A. et al, 1998; Beuscher, P.A. et al. 1993; MacKay, A.P. 2002). Placenta previa, placental abruption, fetal distress, prolonged labor, breech/malpresentation, cord prolapse, and cephalopelvic disproportion are all contributors to the nation's increasing cesarean section rate, and by not having accurate figures for these complications, finding a way to reduce the current national cesarean rate of near 30% to the Healthy People 2010 goal of 15% will be much more challenging.

Infant and maternal transfers are other areas where records did not match. One study reported the specificity for infant transport to be 73% and only 57% for maternal transport. However, both measures reported high positive predictive values (Piper, J.M. et al. 1993). Abnormal conditions of the newborn and congenital anomalies were also underreported on birth certificates, with many conditions being grossly underreported. Major conditions such as anencephalus and spina bifida were better reported, but even major visible abnormalities such as cleft lip/palate were underreported (Piper, J.M. et al. 1993; MacKay, A.P., 2002).

One study also reported variances in reporting accuracy between hospitals in Washington state. One example of the range of accurate reporting by hospitals provided in the articles was cesarean section. The range of accurate reporting between the

hospitals was 37-100%. Other examples of a huge range in accuracy was sensitivity for induction of labor (range 7.9-92.3%), episiotomy (0-86.4%), cephalopelvic disproportion (0-100%), and fetal distress (60-100%) (Parrish, K.M. et al., 1993). The study went on to explain why there is so much variability between accurate reporting in hospitals. Many of the obstetric procedures not directly related to increase in billing amounts were either underreported or not reported at all. Deliveries that are paid by HMO's and their standard flat rate, rather than Medicaid and certain other private insurance carriers that pay per procedure were also more likely to have underreported procedures and outcomes. And since coding of birth certificates is not related to billing, the hospital has less incentive to ensure that birth certificates are filled out completely and accurately (ibid). This is truly a shame when so many of these procedures are used in surveillance for various maternal and child health indicators, and the inaccurate birth certificates are the standard numerous agencies for surveillance and research.

Two studies done on birth certificate accuracy differed in research approach compared with the previously discussed studies. One looked at accuracy of previous pregnancy outcomes on the birth certificate of the second delivery (Adams, M., 2001) and the other looked at incomplete birth certificates as a risk marker for infant mortality (Gould, J.B. et al., 2002). The Adams study was conducted on the theory that previous pregnancy outcomes are used to identify a high-risk population with the goal being to determine how accurate the reporting was. She concluded that researchers should use caution since many areas had low sensitivity of reporting. Previous preterm delivery only had a sensitivity of 29% and previous stillbirth was also low with a sensitivity of 50% for those with gestations of 37 weeks or longer and 67% for those occurring between 20 and

36 weeks. Survival of previous live birth was also underreported, though not as frequently as the previous mentioned indicators; the sensitivity was 85.4% (Adams, M., 2001).

An article on incomplete birth certificates as a risk marker for infant mortality found “that the higher a subpopulation’s risk for poor perinatal outcomes, the greater the likelihood of underreporting on its birth certificates” (Gould, J.B. et al., 2002). Underreporting was more common among mothers who were black, Hispanic, or not born in the United States, were teenaged or older than 40, initiated prenatal care after the first trimester, had delivered six or more children, lacked private insurance, and had less than a high school education. All of these are related to an increase in poor outcomes. Rates for underreporting ranged depending upon when the infant died as well. Infant who died in the first or second 12 hours of life had underreporting rates hovering around 25%; whereas those who died during the remainder of the first week had lower underreporting rates near 14%. This supports the theory that the sicker and more likely to die the infant is, the more underreporting found on various documents (ibid). In over 90% of the birth certificate records without any missing fields, the neonatal and postneonatal mortality rates were lowest at 2.49 and 1.83 per 1000. As the number of missing variables increased, so did the mortality rates. One missing variable correlated with a stark increase in the neonatal (5.35 per 1000) and postneonatal (2.6 per 1000) mortality rate. And with six or more items missing on the birth certificate, the rates skyrocketed to 229.7 and 46.8 per 1000 (ibid). This study, along with those previously mentioned, exhibit a need to re-evaluate the accuracy of the birth certificate record and

evaluate ways to improve accuracy and completeness in these crucial research and surveillance data sources.

## 2.6 Census Data Issues

The two census data issues to be discussed here are underreporting of populations and the validity and reliability of the census data. Underreporting of the census is a problem within the African-American population more so than any other population. Within the black population, males between the ages of 25 and 59 are most likely to be underreported with both male and female children under the age of 9 being the next most highly underreported group (Preston, S. H., et al. 1998).

Each census period, the US Census bureau expects an undercount of the African-American population. Underreporting has been documented as far back as the 1930 census. The census bureau attempts to compensate for the underreporting by analyzing other information such as the number of births, deaths, and migrations to estimate the true size of the country's black population. Several other researchers as well as the census bureau have conducted studies to determine the degree of underreporting and age misreporting of the black population (Preston, S.H. et al. 1998; Siegel, J.S. 1974; Robinson, J.G. et al. 1993). Estimation of underreporting is provided for by race, sex, and age. The design for estimating the amount of underreporting in the young black male population for the 1940 census was based upon selective service registration, and the estimate for under-counting of that population ranged from 13 to 18% (Preston, S.H. et al. 1998). The census reporting between the years of 1940 and 1980 continuously improved, but a decline occurred in 1990 resulting in an estimated undercount of 8.2% of the black male population, with an underreporting of about 11.3% among black males

aged 25-59. The black female population undercount for 1990 was estimated at only 2.8%. The 1990 census period provided some of the most accurate reporting over the previous seven census periods. Curiously, children under the age of nine were estimated to have an underreporting of about 8% in the 1990 census (ibid). An explanation as to why black males 25-59 and children under the age of nine were so grossly underreported in not provided in the discussion of the studies.

A second source of incorrect information in the census data is the mistakes, both intentional and unintentional, made by citizens as they complete the census short or long form. One year after the 1990 census was performed, a study was conducted to determine how accurately low-income, inner-city residents (those more likely to be underreported) completed the short or long form. Since the census is essentially a mail survey, it allows respondents an easy opportunity to complete various errors such as omission, wrong answers whether intentional or unintentional, or incomplete answers. (Iversen, R.R. et al. 1999). Researchers found that although literacy and interpretation of the questions played a major role in the validity and reliability of the census data, interpretative issues related to the perceived purpose and meaning of the census, the commitment to the task of completing the census, and sense of connection to or trust in the government were more significant factors in how accurately the census form was filled out (ibid).

Most of the errors found on the census form during the study were due to skipped or omitted answers to questions (31% on the short form and 40% on the long form). Between a third and a half of study participants reported at least one instance where reading skills created a problem in providing an answer to a particular question, but only

23% of the variance in the error rate found on the short form and 18% on the long form were reportedly due to the participant's reading skills. The rest of the variance was due to attitudes of the study participants. Negative attitudes towards why the census was conducted and why the government wanted to know certain things, for example, resulted in many participants intentionally choosing not to answer certain questions or intentionally answering the question incorrectly. Questions most likely to result in negative comments and diminished response quality were those pertaining to race/ethnicity, marital status, number of children, details about house value, rent or utility costs, job details, and income (ibid). Another study on the response rate of questions related to privacy and confidentiality supported the findings of the Iversen study (Singer, E. and Miller, E. 1993). Many study participants specifically stated that a main reason they omitted certain questions was concern that the US Census Bureau, the Internal Revenue Service, and other public welfare organizations shared information and what they put on the census form could result in personal negative consequences (Iversen, R.R. et al. 1999). Iversen recommends in her discussion, an educational campaign by the US Census Bureau to educate the public on the reasons for conducting the census and the confidentiality of the information provided.

While various inaccuracies occur in the birth certificate and census records, because of the amount of records available and used in this research project, the problem is not as severe as if a smaller population sample was used. All studies performed using census and birth certificate records must face the same issues.

## Chapter 3: The Changing Demographics of East Baton Rouge Parish, Louisiana

### 3.1 About the Study Area

The study area chosen for this research was East Baton Rouge Parish (EBRP), Louisiana. East Baton Rouge parish is in the southeastern section of Louisiana and borders the Mississippi River. EBRP includes the major city of Baton Rouge and the smaller cities of Baker, Zachary, and Central. The parish is bordered by the suburban areas of Livingston, Ascension, and West Baton Rouge Parishes, as well as by the rural parish of East Feliciana in the north. On the southwest border is a small rural section of Iberville Parish. In the 2000 census, the total population of EBRP was 412,852. The total population was up 8.6% from 380,105 in the 1990 census. However, the Census Bureau recently reported that the city of Baton Rouge has lost residents. Between July of 2000 and July of 2004, the city of Baton Rouge lost approximately 4000 people, representing about 2% of the population of the major city. This loss is largely due to residents moving out of the city into the suburbs. This movement to the suburbs has sparked significant population increases in the parishes of Ascension, Livingston, and to a lesser degree, West Baton Rouge (The Advocate, 2005).

The parish of East Baton Rouge was chosen for this study because of the demographic changes of the parish residents, both black and white, over the last century. Some reference will also be made to the parishes of Ascension, Livingston, and West Baton Rouge because the changing demographics in those parishes have occurred simultaneously with, and as a result of the changes in EBRP.

EBRP has experienced a rapid change since the early 1900's when it was a small river town and farming community. Today, over 90% of the parish residents are

considered as living in urban areas, with the most prominent source of economy being the petrochemical industry. Poverty rates, racial distribution, and median household incomes vary drastically across the parish, and all are topics that will be discussed in more detail later in this chapter.

The fastest growing area of EBRP is the southern part of the parish. This area is located along Interstate 10 between the city of Baton Rouge and the Ascension Parish border. Development along Bluebonnet and Siegen roads have quickly changed this area from a fairly densely populated area to a solid suburban community. The area is anchored by the Mall of Louisiana and numerous strip malls on Siegen Lane. The second fastest growing area in EBRP is near Millerville and O'Neal Lane. The area is near the border of Livingston Parish. Livingston Parish and Ascension Parish have also experienced rapid increases in the population at the same time, and parts of these two parishes are now considered suburbs of the city of Baton Rouge. Much of the above mentioned facts will be discussed in greater detail in upcoming sections.

### 3.2 100 Years of Change

In this section, the data from EBRP, Livingston Parish, Ascension Parish, and West Baton Rouge Parish for 10 census periods (1910-2000) will be discussed to show the racial and demographic change of EBRP and its neighboring parishes over the last century. It will be easy to determine that the neighboring parishes are connected with the growth and demographic changes for the major city of Baton Rouge and EBRP. All data for the parish populations was obtained from US Census Bureau publications or their website. In 1910, the population of EBRP was 34,580, followed by Ascension with 23,887, West Baton Rouge with 12,636, and Livingston with 10,627. By 2000, EBRP

had the largest population gain. EBRP's total population was 412,852. The next largest population gain was Livingston with 91,814 residents, then Ascension with 76,627, and West Baton Rouge with 21,601. West Baton Rouge Parish experienced a very small population gain during the 10 census periods when compared with the other three parishes, but by the 2010 census, West Baton Rouge Parish will have experienced a rapid population gain. Since the 2000 census, many new developments and subdivisions have been planned and/or constructed in the parish. It is clear from the data presented here and in the following figures that Ascension and Livingston parishes have benefited dramatically in terms of population growth from the growth seen in EBRP as the suburban areas for the city of Baton Rouge continue to spread farther away from the downtown and the city limits. See Figure 3.1 and Figure 3.2 for graphs of the 10 census periods population change for the mentioned parishes. Figure 3.10 shows the percent increase in the population of the parishes from the previous census.

The demographics of the parishes also changed over the years. All four parishes had a higher percentage of black residents in the 1910 census than in the 2000 census. Ascension, Livingston, and West Baton Rouge parish have experienced a continuous decline or only small early gains in the total percentage of black residents in relation to white residents, while EBRP experienced a decline until 1970 at which point the percentage of black population began to increase at a faster rate than that of white residents. In the 1990 and 2000 census periods, EBRP experienced a negative population increase in the number of white residents. Livingston Parish, while experiencing a large population gain in white residents during the 1970, 1980, 1990, and 2000 census, experienced a negative population gain in the number of black residents. See Figures 3.3,

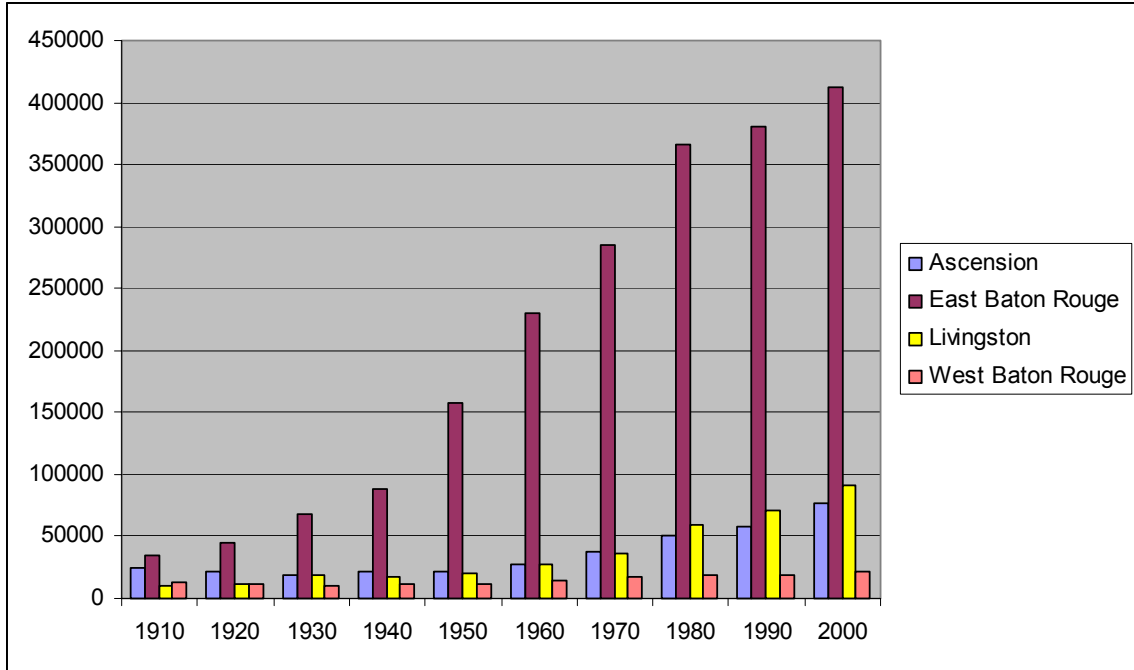


Figure 3.1 Population Changes for Ascension, EBR, Livingston, and WBR

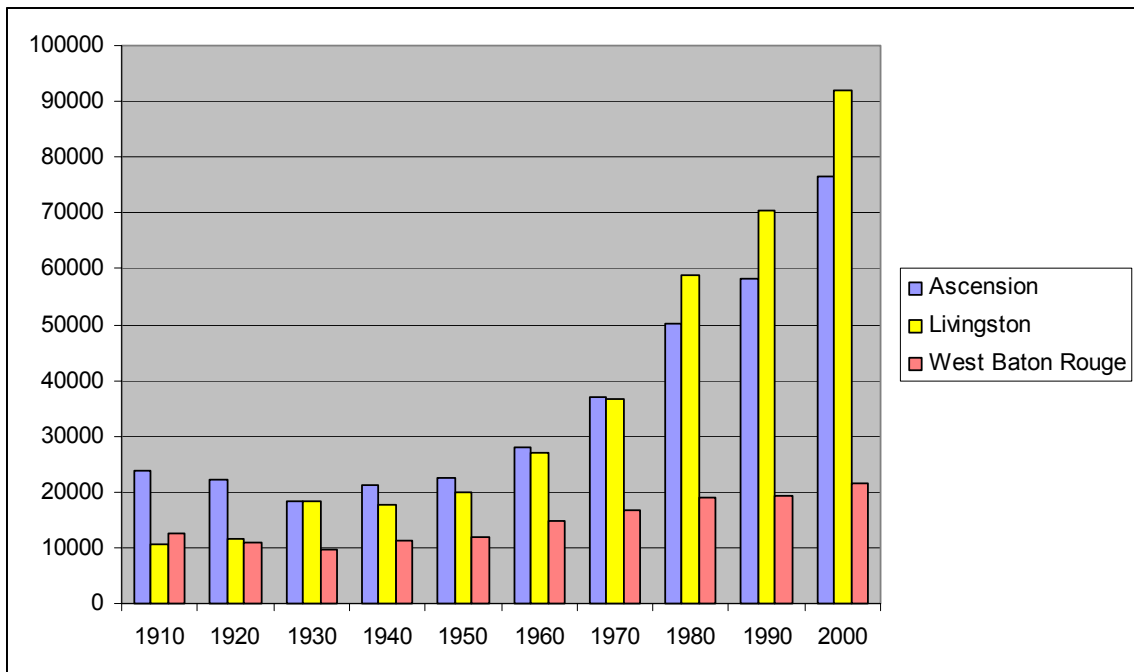


Figure 3.2 Population Changes for Ascension, Livingston, and WBR Parishes

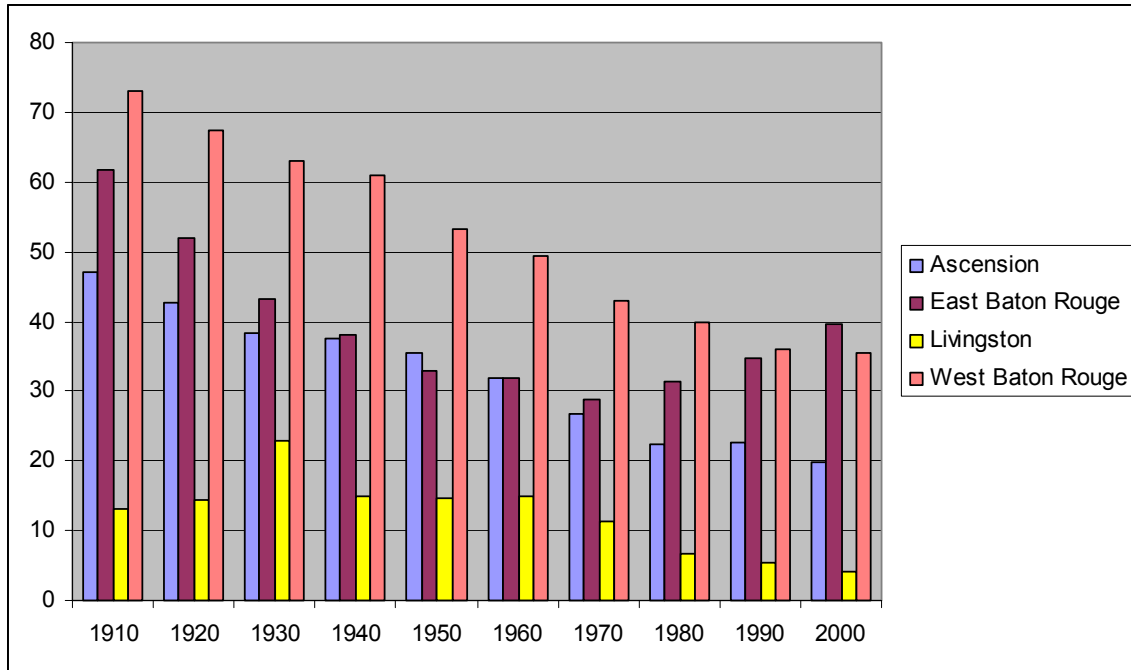


Figure 3.3 Percent black residents in the four parishes

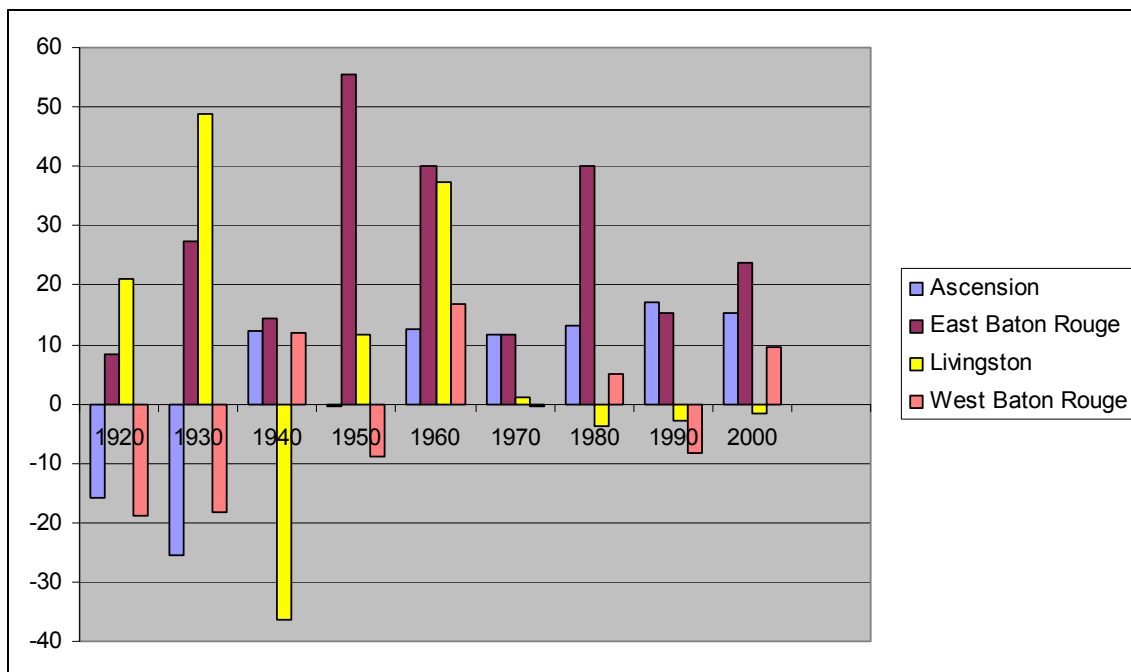


Figure 3.4 Percent increase in the population of black residents

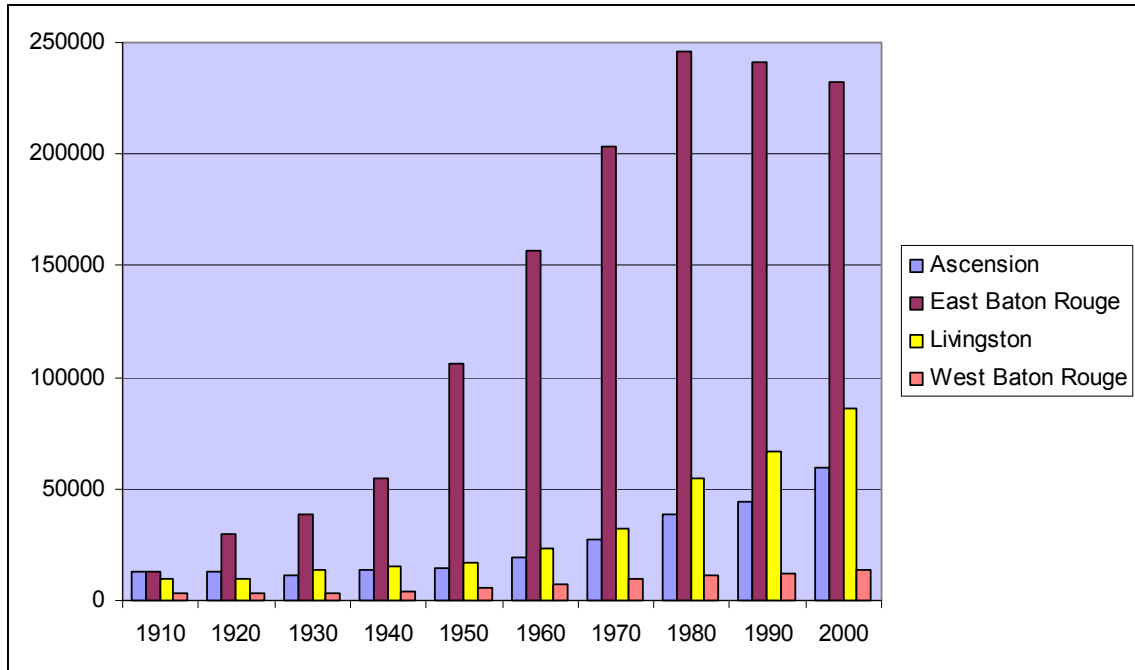


Figure 3.5 Number of white residents in the four parishes

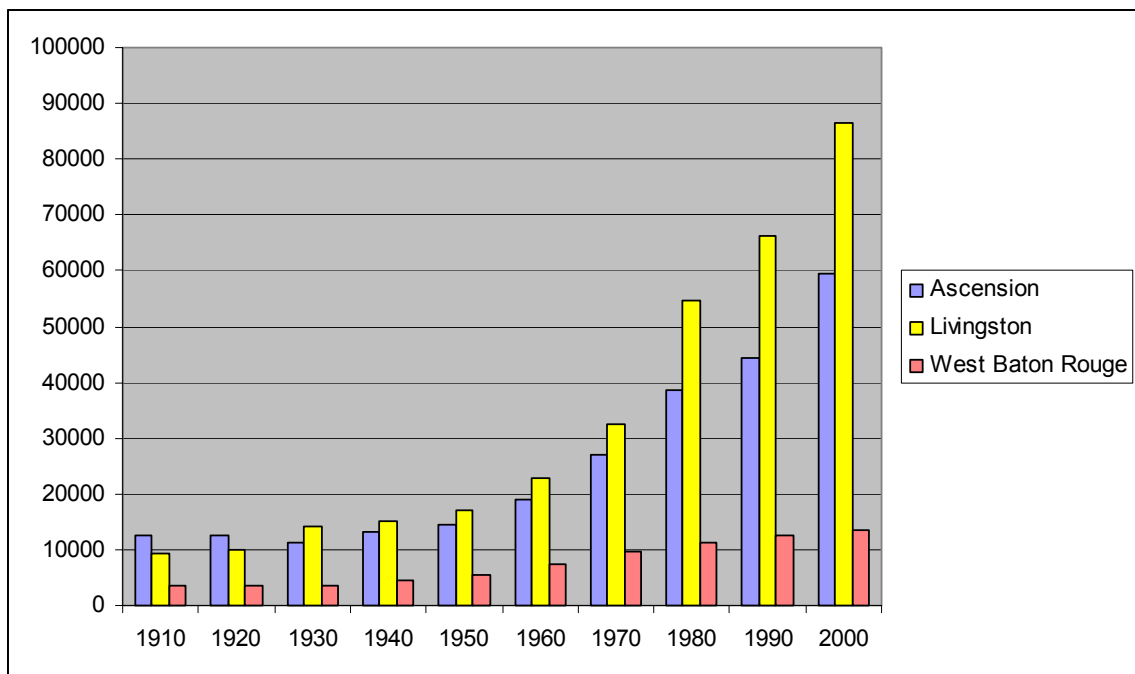


Figure 3.6 Number of white residents in Ascension, Livingston, and West Baton Rouge

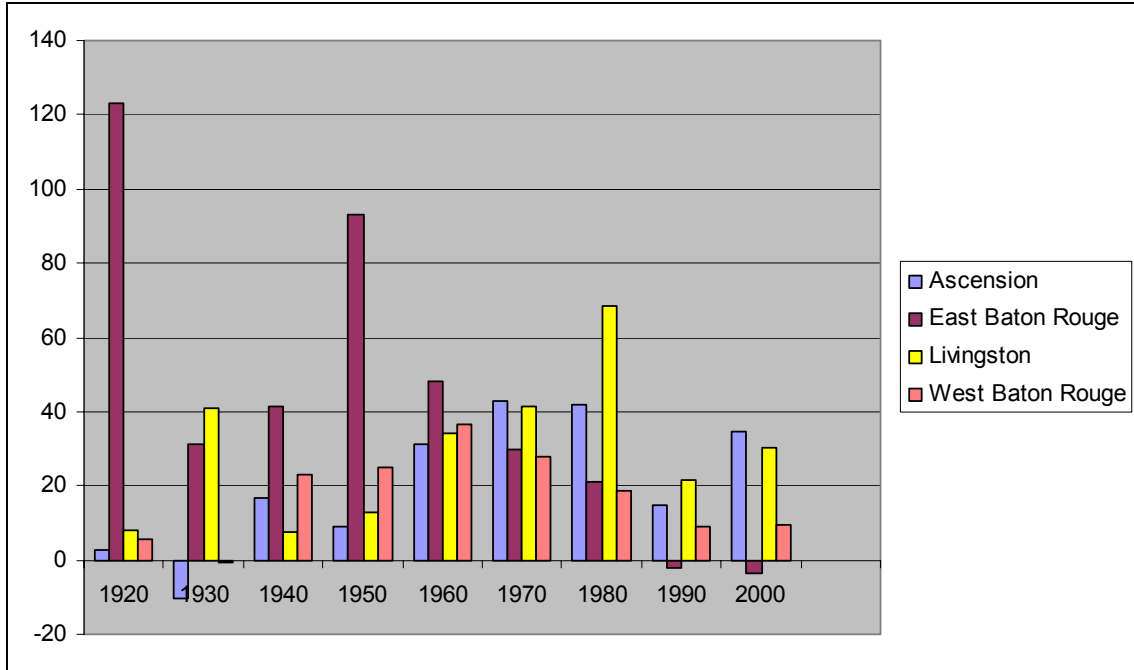


Figure 3.7 Percent increase in the population of white residents

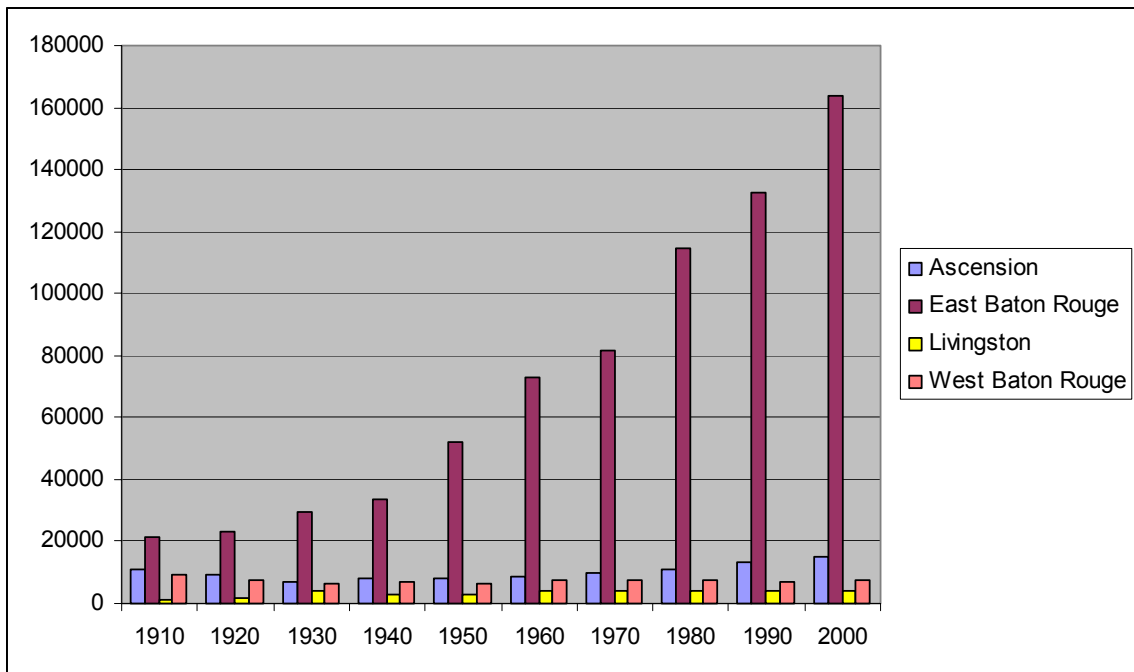


Figure 3.8 Number of black residents in the four parishes

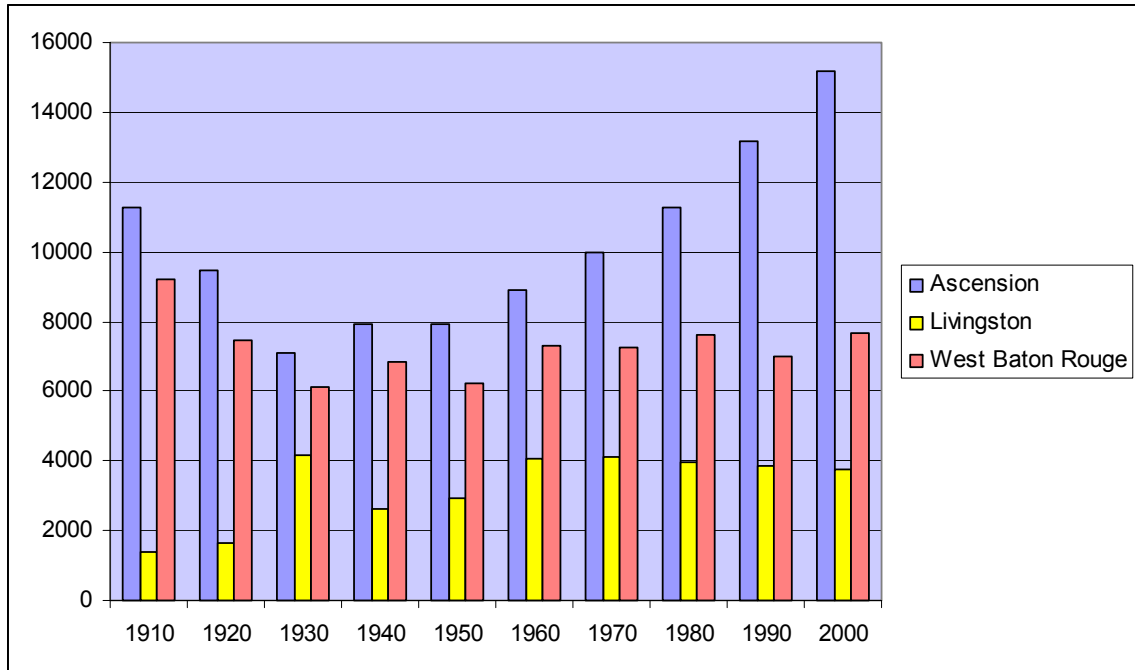


Figure 3.9 Number of black residents in Ascension, Livingston, and West Baton Rouge

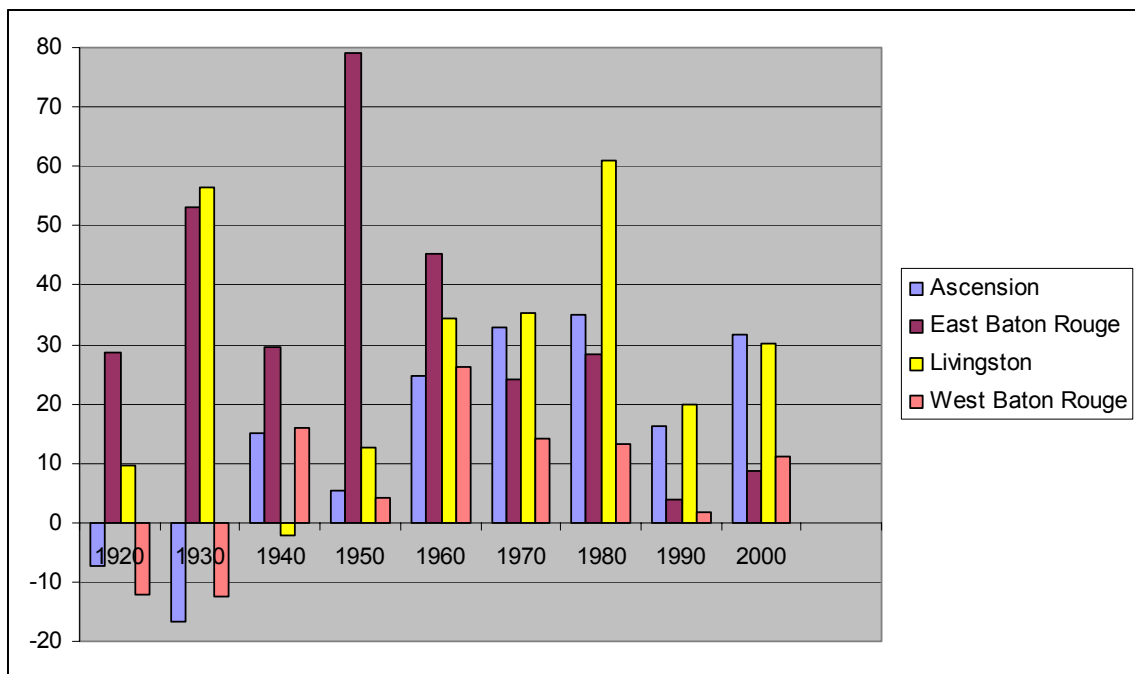


Figure 3.10 Percent change of the population of the four parishes

3.4, 3.5, 3.6, 3.7, 3.8, and 3.10 for graphs of the racial population changes in these four parishes. Currently, Livingston Parish has a very small minority of black residents (4.1% at the 2000 census) when compared with EBRP (39.7%), West Baton Rouge (35.5%), and Ascension (19.8%). Figures 3.4 and 3.6 show that Livingston Parish has experienced a negative population gain of black residents over the last three census periods, while EBRP has experienced a negative population gain of white residents over the last two census periods.

There are many thoughts as to why the parishes of Livingston and Ascension have experienced such drastic increases in the population, specifically that of white residents. The reasons; however, will vary depending upon who you ask. Over the last 30 years in East Baton Rouge parish, there has been a great shift in location among the black residents. During the years before and surrounding the Civil Rights movement, the black residents concentrated themselves in the urban, central-city area of Baton Rouge. After the Civil Rights movement, more opportunities for the black residents of the parish become available and a large transition occurred as middle- and upper-class black residents moved out of their inner-city neighborhoods into those neighborhoods populated with white, middle-class residents. As this transition occurred, many of the white residents moved out of those neighborhoods into new construction in other parts of EBRP or the surrounding parishes of Livingston and Ascension. As of the 2000 census, West Baton Rouge, as previously mentioned, had not experienced a huge influx of residents though the situation is changing. As the advantaged middle- and upper-class black population increases, more and more neighborhoods are undergoing the shift from predominately white to predominately black, and more and more white residents were

moving farther out from the city of Baton Rouge. This is a continuation of the intense racial segregation in this part of the country. Other major cities have experienced this same kind of demographic shift over the last 30 years; Chicago being an example. Sadly, the black residents left behind in the inner-city areas have been the ones to suffer the most. This was also discussed in Section 1.5.3.

The forced desegregation of EBRP public schools has not helped this situation any. Many students are bussed to schools not in their neighborhood, and this has resulted in an increase in the enrollment of private schools in EBRP. Residents, specifically white residents, who cannot afford or do not want to pay for private schools, have moved into Livingston or Ascension parish where there is not a desegregation order in place and the concept of neighborhood schools exists. The school systems in Ascension Parish and more so in Livingston Parish have been forced to drastically and rapidly expand to meet the influx of residents. Another reason for the change in demographics of EBRP is related to crime. Crime rates are typically highest in the inner-city region, and those who have the means to leave the inner-city or any other areas with high crime are doing so.

The great black migration will be briefly discussed to provide a basic understanding of the effect it had upon the United States. During the first half of the 20<sup>th</sup> century, race was thought of as a Southern issue, being that the vast majority of blacks lived in the south, specifically in the rural south. Black residents were still crucial in the cotton industry, not as slaves, but as sharecroppers who generally fared worse than slaves. After a prosperous decade for cotton farmers, the price of cotton dropped dramatically in 1920 and did not recover to the very high prices found in the 1910's. Many black residents became increasingly mobile moving from farm to farm to farm

trying to make enough to support their families. Around the same time, word was spreading among blacks about the higher paying jobs in major cities, especially those cities in the north, like Chicago. Many black residents saw this as an opportunity to better themselves and moved. The black population of Chicago exploded, from 44,000 in 1910 to 234,000 in 1930 (Lemann, N. 1991).

Even with the beginnings of the mass black migration to the north, 77% of black residents still remained in the South in 1940, with about 50% of the total nationwide black population being in the rural South where they still functioned as a crucial element in the cotton industry (ibid). The mechanical harvesting of cotton changed that. Of the six and a half million black residents who moved north between 1910 and 1970, about five million of them moved after 1940, representing the largest and most rapid mass migration of people in history. As Lemann stated in his book *The Promised Land*, the migration of black residents to the north “outranks the migration of any ethnic group—Italians or Irish or Jews or Poles—to this country”. The great black migration would forever change the way this country viewed race, and race relations would become a dynamic national issue in the second half of the 20<sup>th</sup> century.

While the black residents were also moving north, even those that remained in the south were also moving out of rural communities into the cities, so much in a way that “urban has become a euphemism for black” (Lemann, 1991). Chicago’s black population continued to explode. Between 1940 and 1960 the black population of Chicago grew by over a half million residents, from 278,000 in 1940 to 813,000 in 1960. And the blacks were continuing to move into the city. As early as the 1940’s in Chicago, the middle-class black population was already moving within the city. As the black population grew

and the neighborhoods became poorer and denser, the middle-class blacks who had the ability to “get away from the slums” did so by moving “the black belt southward into previously white neighborhoods”, a process more difficult at the time because of customs and some laws that prevented blacks from buying houses or living in a certain part of town (ibid). The movement of black residents out of the poor, dense, inner-city slums of Chicago is the same kind of movement that was, and continues to be experienced, in EBRP.

The great black migration is recorded to have ended in 1970 at which time only about half of the black population resided in the South and only 25% of the entire population was considered rural (ibid). Much has been written on the great black migration, but less has been published on black migration as a result of the Civil Rights movement and the changes and betterments experienced by blacks in the United States. At the time of the Civil Rights movement the black population in the country was predominately urban, with many of the urban environments being reported as “ghetto slums” (Wilson, W.J., 1987). The Civil Rights movement was the beginning of change among the living conditions of many blacks as they strived to better themselves, become more accepted as equals to the white population, and live and function in a less segregated way. This first section is intended to examine how the demographics of the black population in EBRP has changed since the Civil Rights movement and the end of the great migration of blacks in the United States. This will set the stage for an analysis of low birthweight and preterm delivery among deliveries, where they are occurring within EBRP, and the racial disparity associated with negative birth outcomes.

### 3.3 The Changes in EBRP: 1970 to 2000 Census Periods

Throughout the rest of this chapter, data presented will reflect EBRP unless specifically stated as corresponding to a neighboring parish. References to Livingston, Ascension, or West Baton Rouge will only be presented as needed to clarify a point or add to the reasoning behind a change in EBRP. Unfortunately, due to the variation in reporting between the four census periods and lack of funds to pay for special runs of the individual level data collected during the different census periods, several fields/variables that were intended to be presented in the analysis were unable to be included. Those areas include that of change in female headed households, poverty among female headed households, educational attainment, fertility, as well as these measures separately by race. The areas that are discussed in this section include the demographic/racial geographic change of the population, distribution of poverty, household incomes, new construction, mobility of the population, and home values. Many of these variables will be discussed and shown as a change over the four census periods and how the change has affected the EBRP population distribution. Table 3.1 displays the information presented in the next section.

#### 3.3.1 The Change in Racial Distribution of EBRP

At the time of the 1970 census, there were 285,142 residents in EBRP with 203,319 being white and 81,823 being black. The black population represented 28.7% of the EBRP population. At the time of the 1970 census, the black population was predominately located in the downtown area of the parish. The northern part of the parish was the least segregated part of the parish. See Maps 1 and 2. For each census period, two maps showing demographic change of the population will be available with

the difference being the percents represented by the graduated colors. In the city of Chicago after the Civil Rights Movement, the demographics of the city changed. EBRP was no different. As black residents were able to obtain better jobs and were treated equally by new anti-discrimination laws in the housing market, for example, the black population began to make their way out of the highly segregated and profoundly poverty-stricken inner-city area.

By the 1980 census, evidence of the out-migration of the black population from the inner-city became evident. See Maps 3 and 4. Census tracts closest to those of the inner-city/downtown area became less segregated as the black population began its move from the inner-city to the surrounding neighborhoods. The most inner-city of the census tracts became more predominately black. By the time of the 1980 census, the EBRP population had increased 28.4% from the previous census to post a population of 366,191 persons. Of the total population, 31.3% were black representing an increase of 40.2% from the 1970 census. The white population also increased between the two census periods; however, it was lower at 21.2%. At the same time, the white population in Livingston Parish increased dramatically. The white population in Livingston Parish increased 68.6% while the black population fell 3.7%. Blacks represented 11.2% of all Livingston Parish residents in the 1970 census and only 6.7% in the 1980 census. Ascension Parish also experienced a large increase in the percentage of white residents (42.1%) and a smaller increase in black residents (13.1%). West Baton Rouge Parish has posted much less population gain throughout the last 10 census periods, though it follows the trend of Livingston and Ascension Parishes in that it is becoming less black and more white with each new census.

Table 3.1 Changes in the population over four census periods

Ascension				
	1970	1980	1990	2000
Total population	37,086	50,086	58,214	76,627
% Increase from previous census	32.8	35.1	16.2	31.6
White population	27,129	38,542	44,301	59,538
% White increase from previous	42.7	42.1	14.9	34.4
Black population	9,957	11,262	13,176	15,179
% Black increase from previous	11.7	13.1	17	15.2
% of the population black	26.8	22.5	22.6	19.8
East Baton Rouge				
	1970	1980	1990	2000
Total population	285,142	366,191	380,105	412,852
% Increase from previous census	24	28.4	3.8	8.6
White population	203,319	246,341	240,961	232,492
% White increase from previous	29.6	21.2	-2.2	-3.5
Black population	81,823	114,741	132,402	163,787
% Black increase from previous	11.8	40.2	15.4	23.7
% of the population black	28.7	31.3	34.8	39.7
Livingston				
	1970	1980	1990	2000
Total population	36,511	58,806	70,526	91,814
% Increase from previous census	35.4	61.1	19.9	30.2
White population	32,409	54,640	66,327	86,389
% White increase from previous	41.4	68.6	21.4	30.2
Black population	4102	3952	3839	3778
% Black increase from previous	1.2	-3.7	-2.9	-1.6
% of the population black	11.2	6.7	5.4	4.1
West Baton Rouge				
	1970	1980	1990	2000
Total population	16,864	19,086	19,419	21,601
% Increase from previous census	14	13.2	1.7	11.2
White population	9,604	11,384	12,383	13,551
% White increase from previous	28	18.5	8.8	9.4
Black population	7,260	7,626	6,989	7,659
% Black increase from previous	-0.4	5	-8.4	9.6
% of the population black	43	40	36	35.5

At the time of the 1990 census, EBRP posted only a small total population gain, up from 366,191 people to 380,105 people. The white population decreased 2.2% from the previous census while the black population increased 15.4% from the 1980 census resulting in 34.8% of EBRP residents being black. At the same time, Livingston Parish posted a 21.4% increase in the number of white residents and a 2.9% decrease in the number of black residents. Ascension Parish posted a 14.9% increase in white residents and a 17% increase in black residents.

Within EBRP, the out-migration of black residents from the inner-city area they predominately resided in at the time of the 1970 census was still occurring. Several census tracts that were predominately equally mixed between the number of black and white residents at the time of the 1980 census were more black at the 1990 census. Census tracts farther out from the inner-city were now categorized as a racially mixed tract in the 1990 census, when during the 1980 census, the tract was heavily white. The inner-city also became more predominately black when compared to the previous census periods. Northern parts of the parish were also shifting from a fairly even racial distribution to more white. See Maps 5 and 6. As the population shift began occurring, black residents began moving into established neighborhoods that had been predominately white. As this began happening, the white residents began to move into areas of new construction. Maps 7 and 8 provide a representation of areas with newer constructions. For the most part, black residents are not yet moving into areas of the most profound economic growth and new developments. The area within EBRP that experienced the largest increase in new developments and economic growth was the southern part of the parish nearing Ascension Parish and northern EBRP. Anyone who

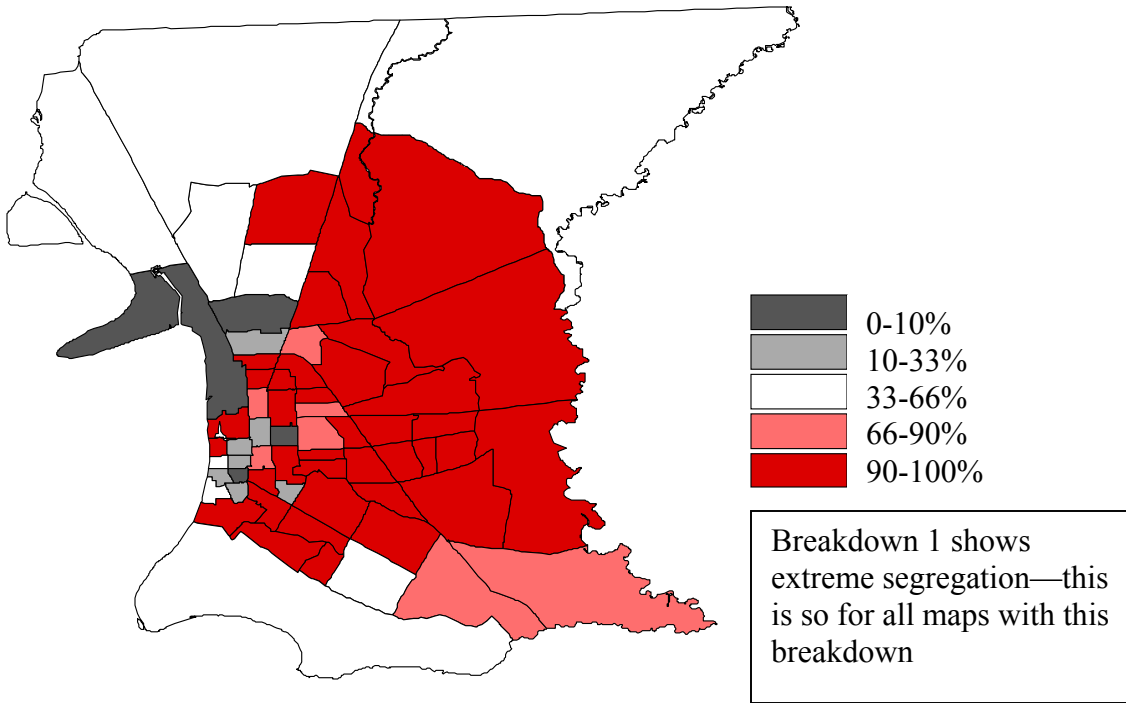
has lived in the Baton Rouge Metropolitan Area within the last 10 years has noticed the increased development along I-10 between Essen and the Ascension Parish line.

The 2000 census posted a second consecutive census with EBRP experiencing a loss of white residents. The number of white residents fell 3.5% while the number of black residents increased 23.7% resulting in black residents making up 39.7% of the parish's total population. The parish as a whole had a population increase of 8.6%, from 380,105 in 1990 to 412,852 in 2000. Ascension parish experienced a 34.4% increase of white residents and a 15.2% increase of black residents. For the third census in a row, Livingston Parish posted a decline in the number of black residents (down 1.6%) while experiencing a gain in white residents of 30.2% from the previous census period. Livingston Parish at the time of the 2000 census, had a black population of only 4.1% down from 11.2% in 1970. Ascension Parish also experienced a decline in black residents during the same four census periods from 26.8% to 19.8%. The change in EBRP was an increase from 28.7% in 1970 to 39.7% in 2000.

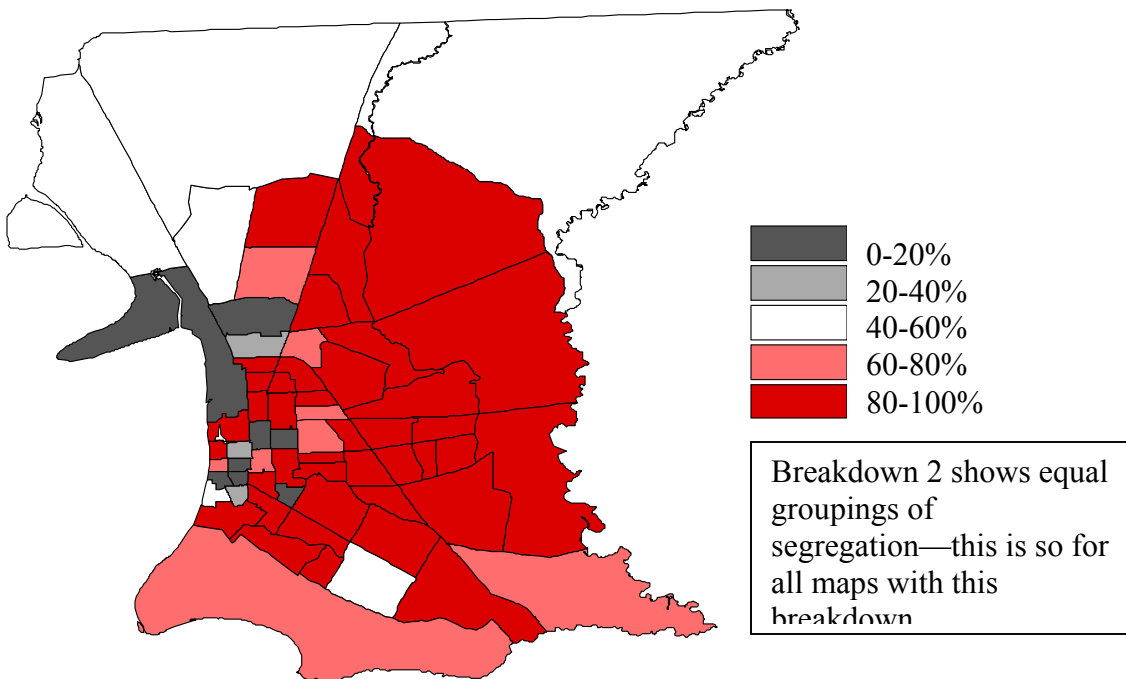
As expected, the geographic distribution of blacks within the parish also changed with the black population spreading farther away from the inner-city area and even fewer census tracts experiencing a high percentage of white residents. Census tracts closest to the inner city area were almost exclusively black and census tracts that were the most racially mixed in the prior census were less so in the 2000 census. Maps 9 and 10 provide a reference for population changes since the 1990 census. Maps 11, 12, 13, and 14 are also maps of the demographic change in EBRP, but are at the block group level rather than the census tract level. Maps for block group level at the 1970 and 1980 census level are not available because funding was not available to have special runs

done to obtain statistics at that level, and printed reports from the census were only at the tract level. Maps 11 and 12 provide the same representation of the 1990 census as Maps 5 and 6, but at a different geographic area. Maps 13 and 14 do the same as Maps 9 and 10, but at the different geographic level. The maps at the block group level provide a striking representation of the areas of the parish where white residents make up the vast majority. As the black population of the parish has shifted and grown, it is clear that the white population is on the move as well. The large dark red area in the central to northeastern part of the parish on Maps 13 and 14 are the Central/Greenwell Springs area and the area to the extreme southeast is the area where I-10 passes into Ascension Parish.

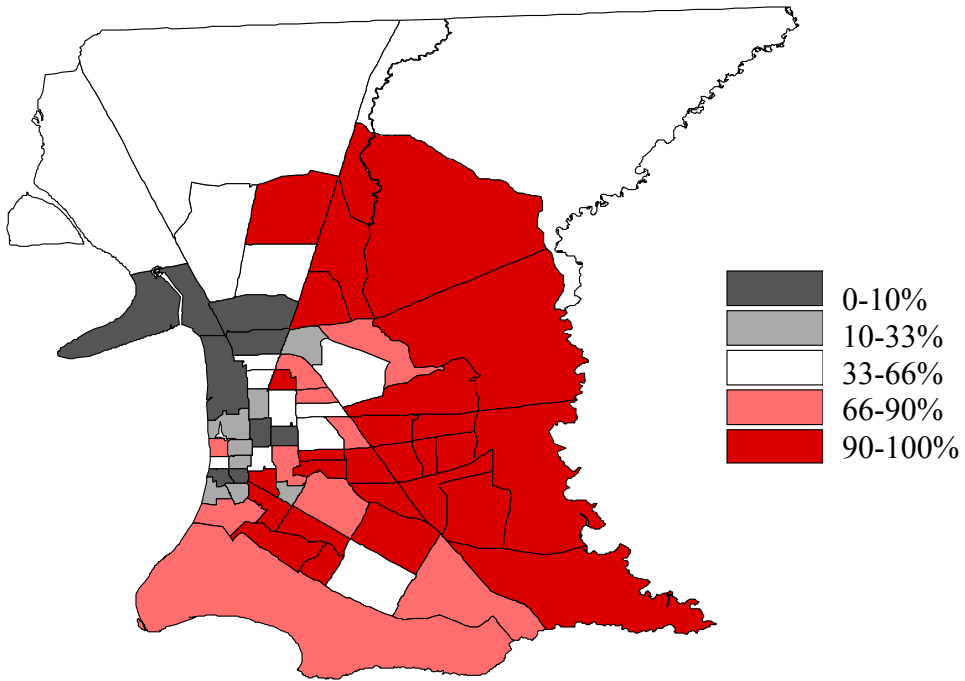
When looking at the change in demographics from the 1970 to 2000 census, it is evident that the black population of the parish was out-migrating from the inner-city area into what were predominately white, middle-class census tracts, the same as Chicago experienced decades earlier. As the blacks moved into these census tracts, the white residents began to move into areas of new construction as new filings to certain neighborhoods or into the northern and southern areas of EBRP that previously were rural as depicted in Maps 7 and 8 of the years of home constructions throughout the parish. Along with the shift in the black population occurred a shift in poverty and median household income distribution as well as changes in the value of homes in areas that shifted from predominately white to predominately black and new construction flourished. The inner-city area became poorer and home values are the lowest in the parish. These topics will be discussed in later sections. Everything being experienced recently in EBRP is similar to the experiences of many northern cities during the Great Black Migration. It will be interesting to see how the (continued on page 105)



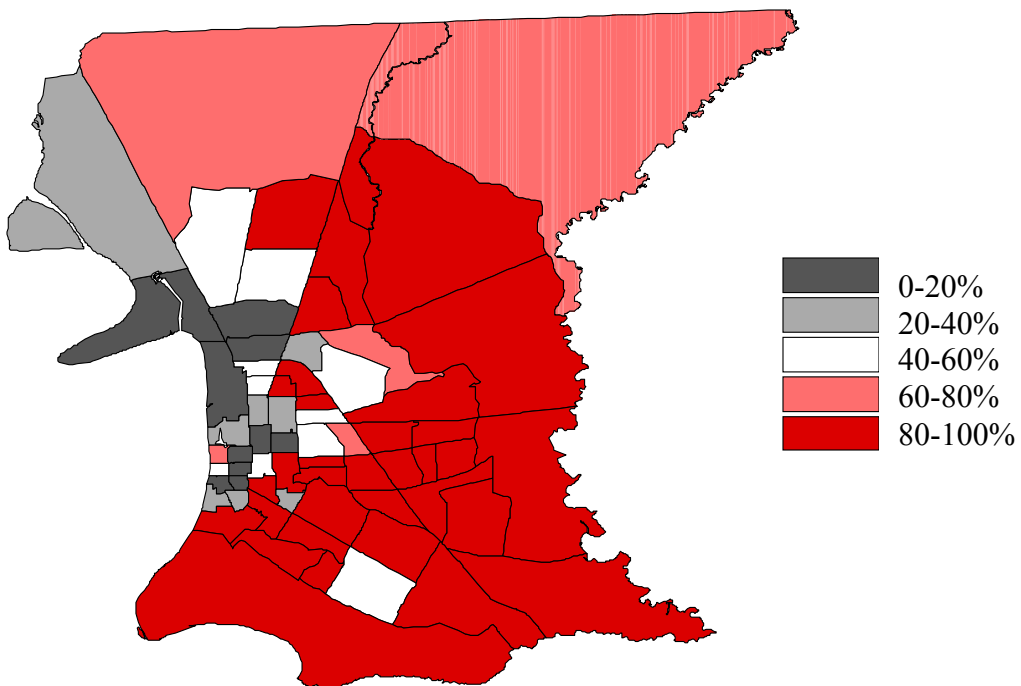
Map 3.1: Percent of white residents in each census tract according to the 1970 census: Breakdown #1



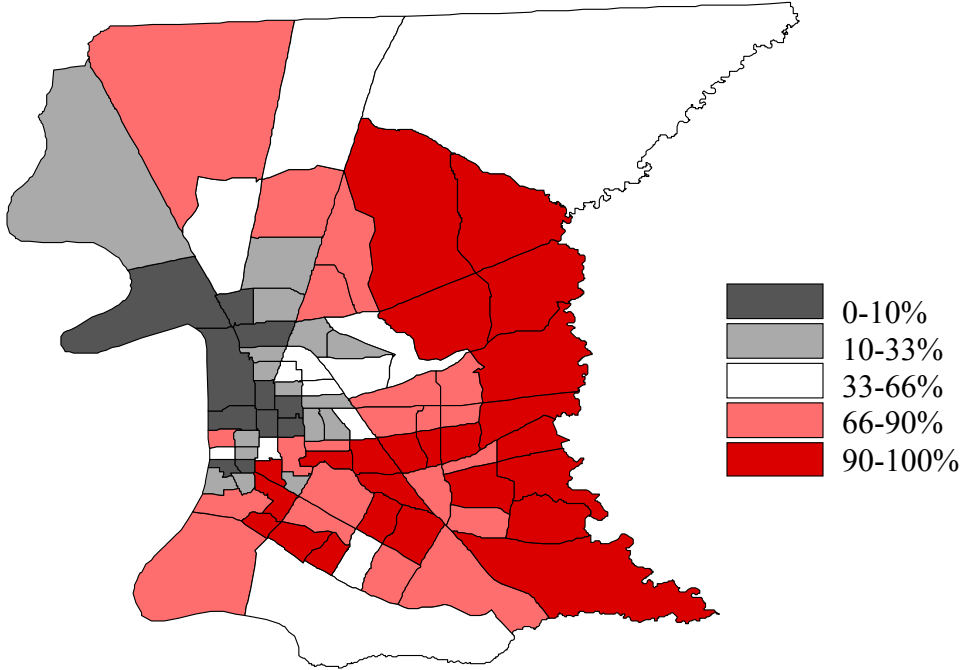
Map 3. 2: Percent of white residents in each census tract according to the 1970 census: Breakdown #2



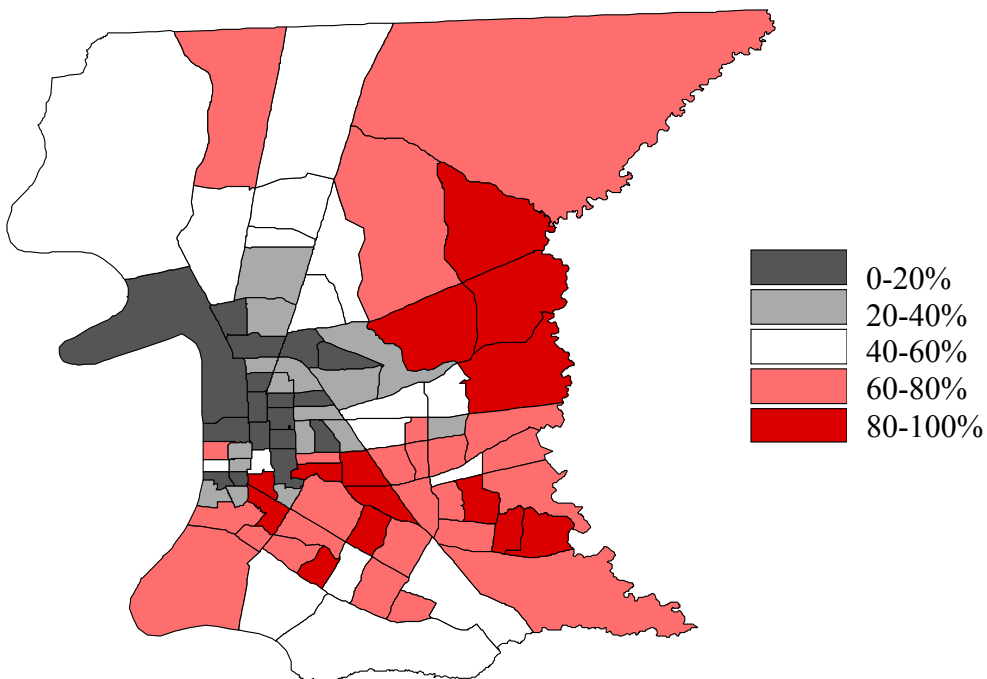
Map 3.3: Percent of white residents in each census tract according to the 1980 census: Breakdown #1



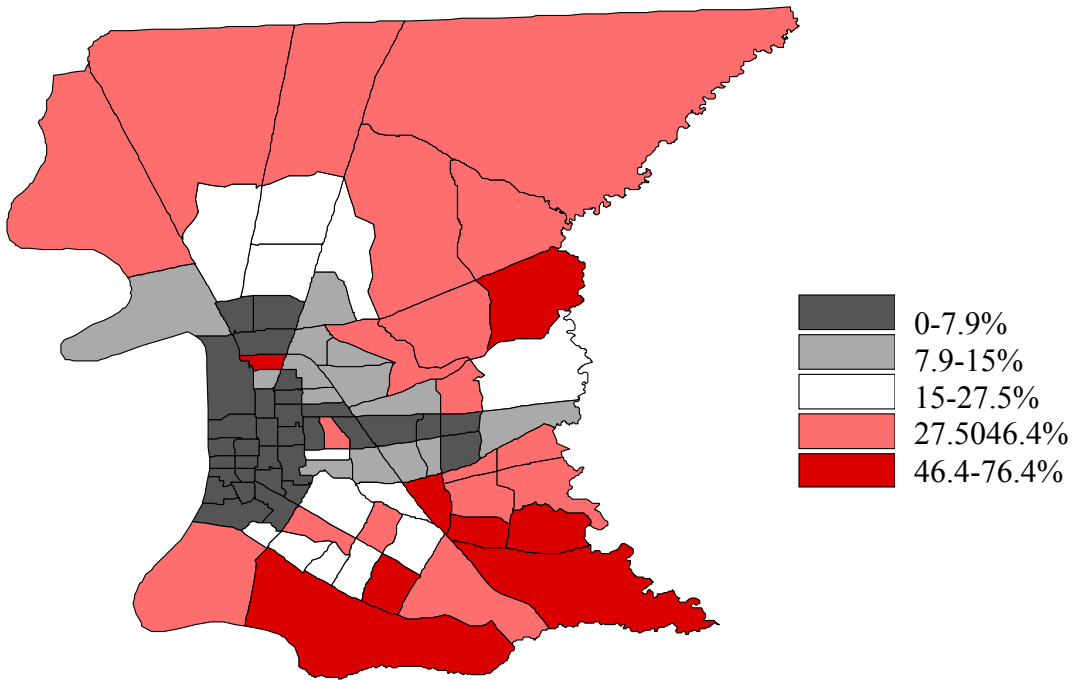
Map 3.4: Percent of white residents in each census tract according to the 1980 census: Breakdown #2



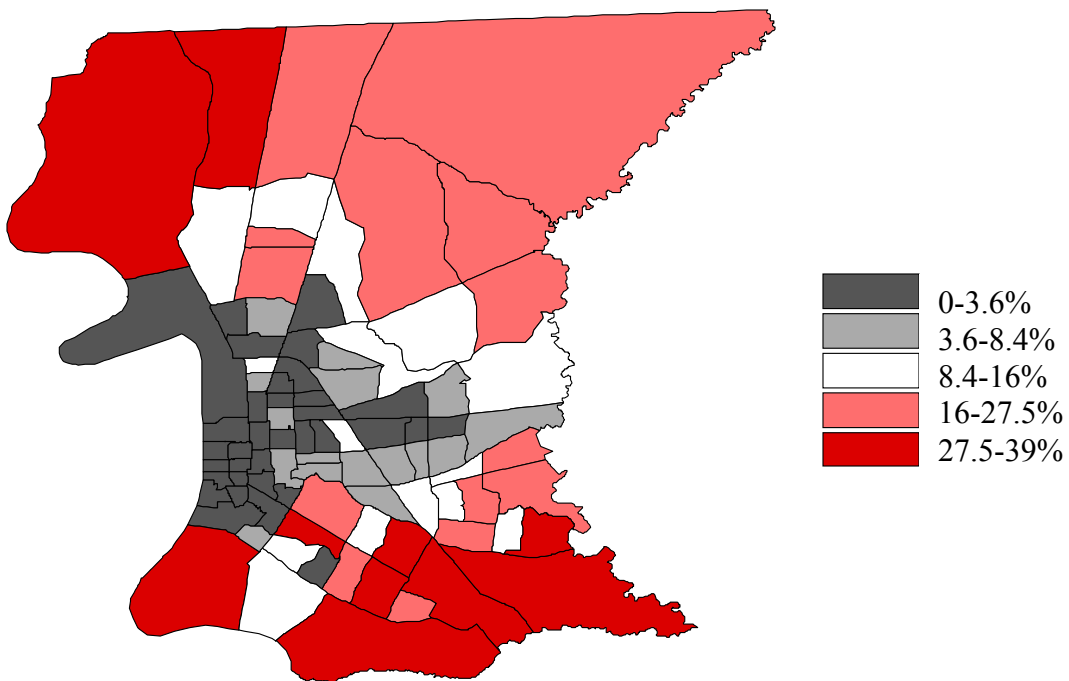
Map 3.5: Percent of white residents in each census tract according to the 1990 census: Breakdown #1



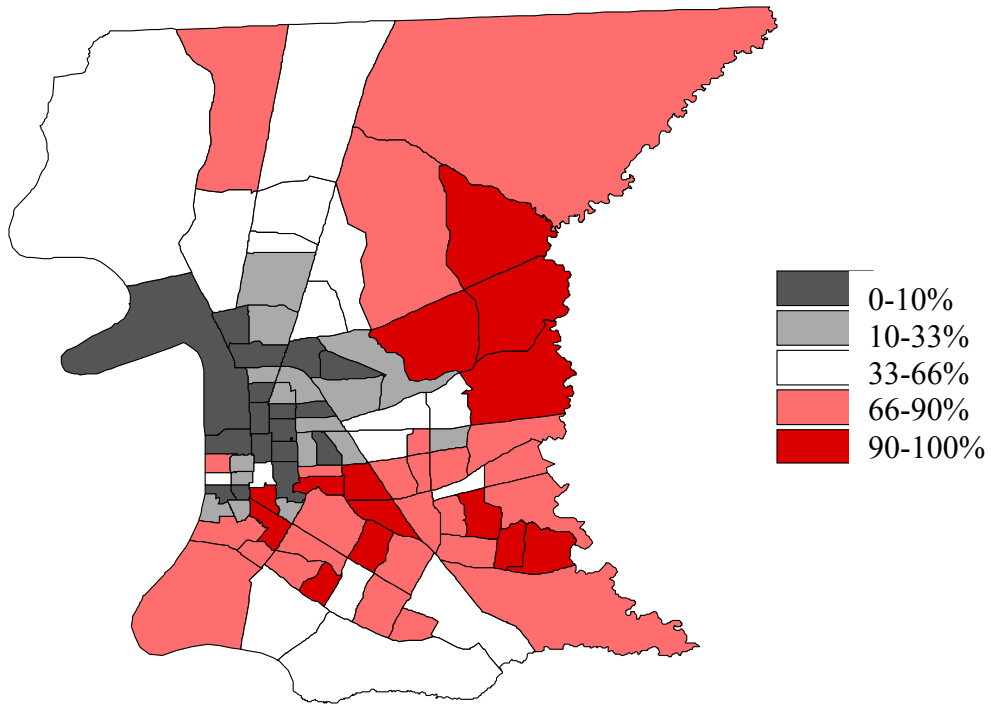
Map 3.6: Percent of white residents in each census tract according to the 1990 census: Breakdown #2



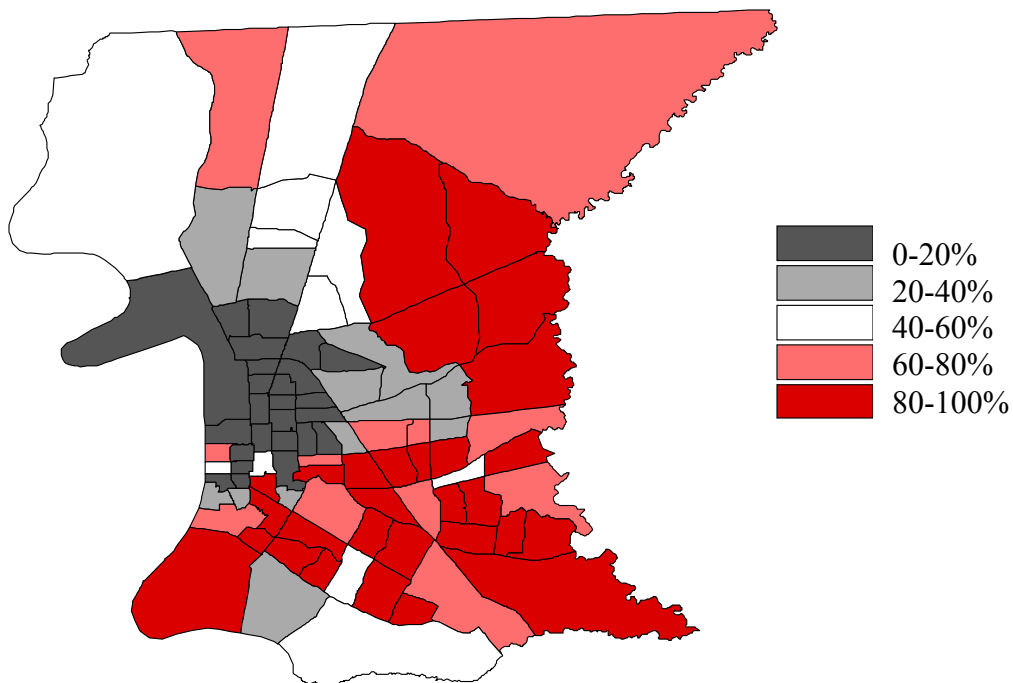
Map 3.7: Percent of new housing in each block group built between 1980 and March of 1990 according to the 1990 Census



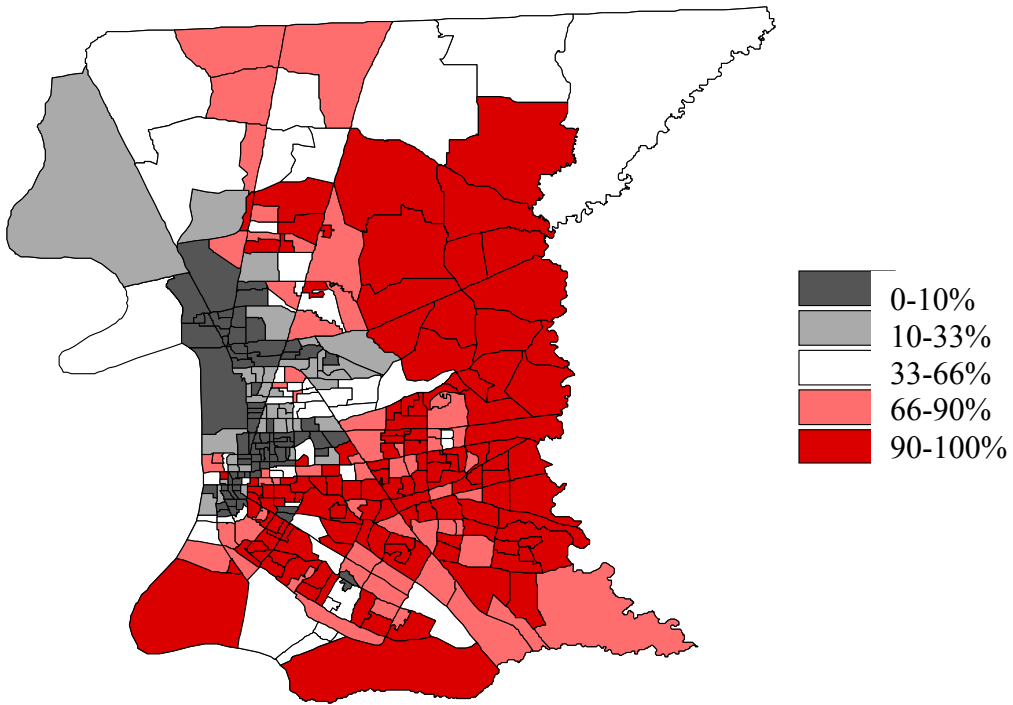
Map 3.8: Percent of new housing in each block group built between 1990 and March of 2000 according to the 2000 Census



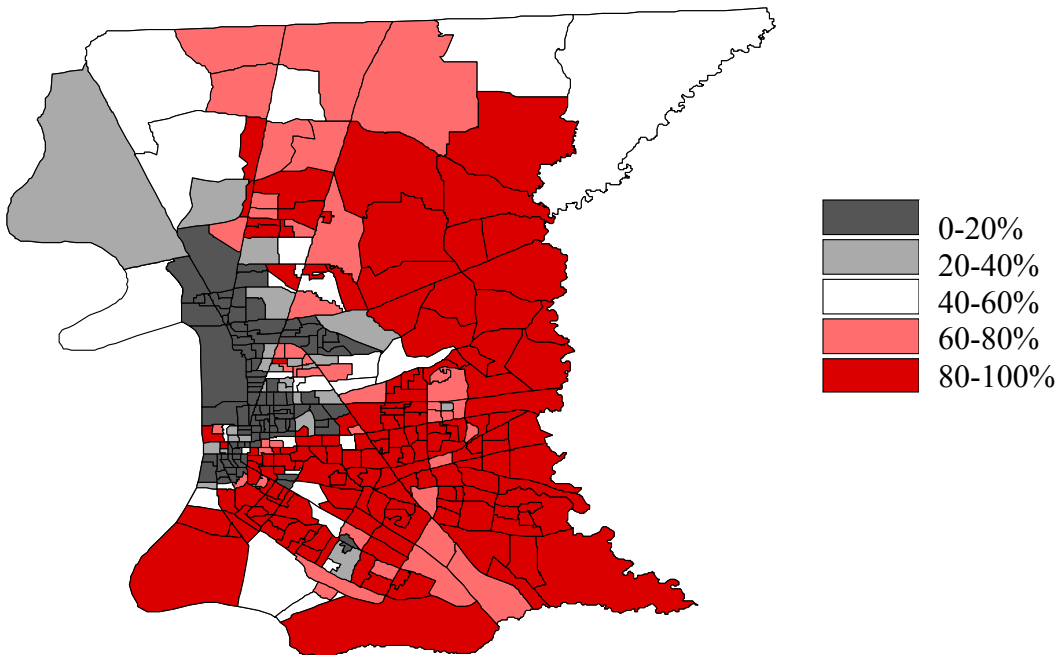
Map 3. 9: Percent of white residents in each census tract according to the 2000 census: Breakdown #1



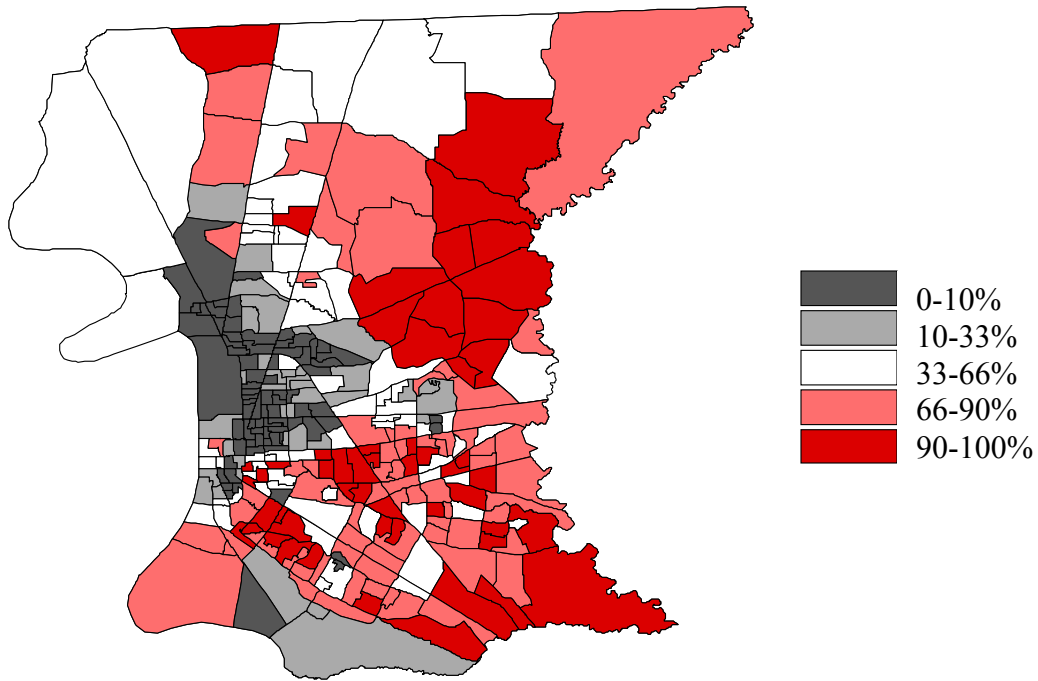
Map 3.10: Percent of white residents in each census tract according to the 2000 census: Breakdown #2



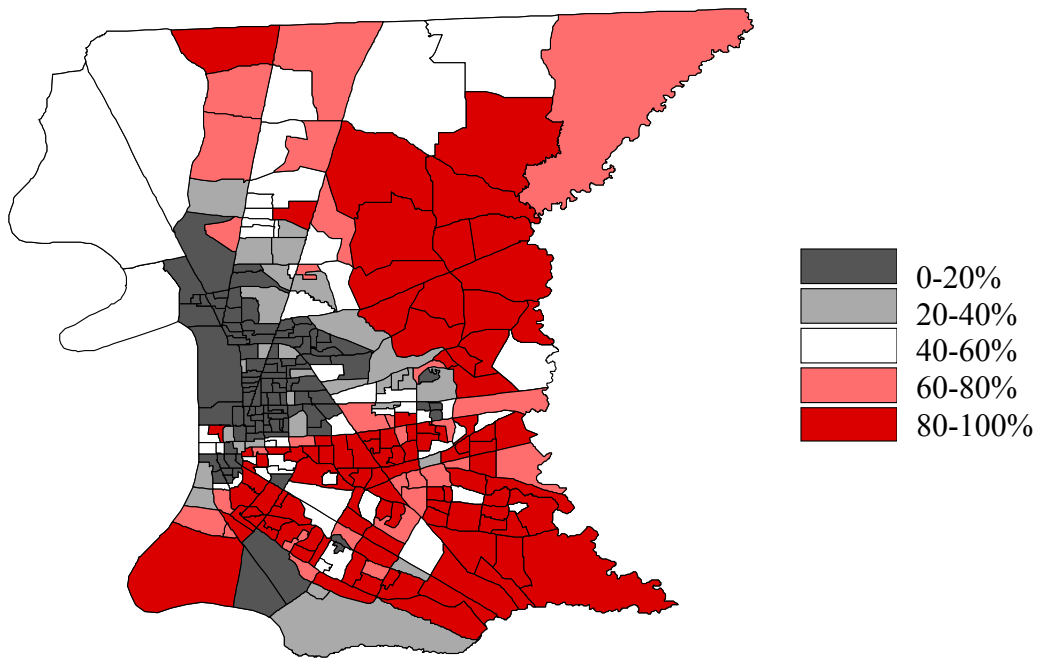
Map 3.11: Percent of white residents in each census block group according to the 1990 census: Breakdown #1



Map 3.12: Percent of white residents in each census block group according to the 1990 census: Breakdown #2



Map 3.13: Percent of white residents in each census block group according to the 2000 census: Breakdown #1



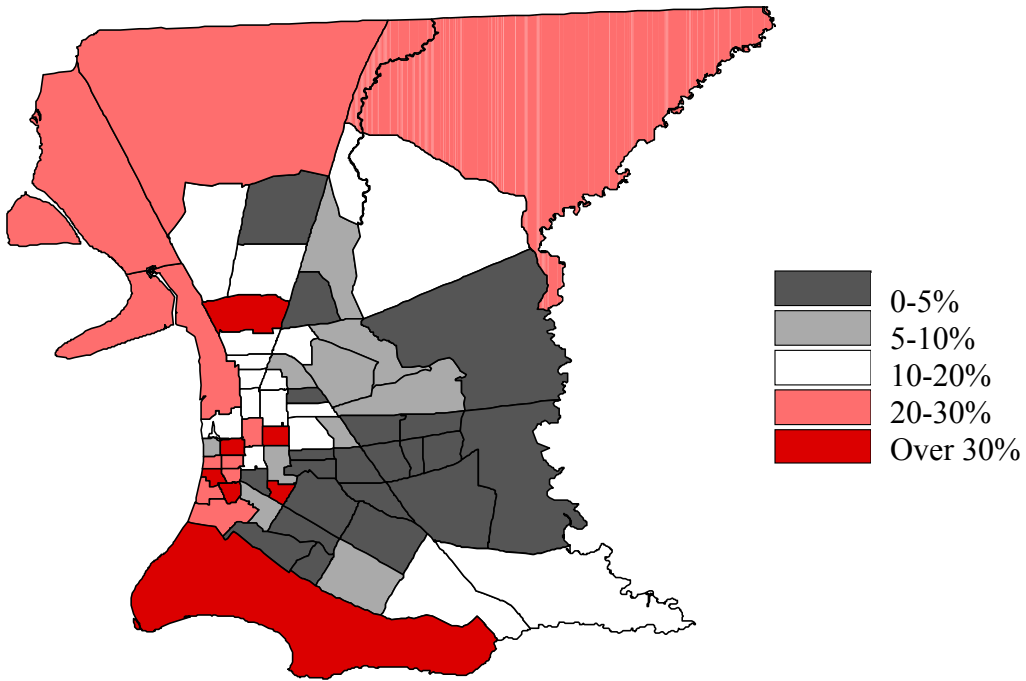
Map 3.14: Percent of white residents in each census block group according to the 2000 census: Breakdown #2

August 29, 2005 landfall of Hurricane Katrina affects the distribution of black residents as the numbers swell due to relocation efforts, both in EBRP and other major cities which took in thousands of poor, black evacuees. Hurricane Katrina has the potential be the cause of the second largest black migration within this country and it is inevitable that the 2010 census will reflect changes due to the forced relocation of poor, black New Orleans residents.

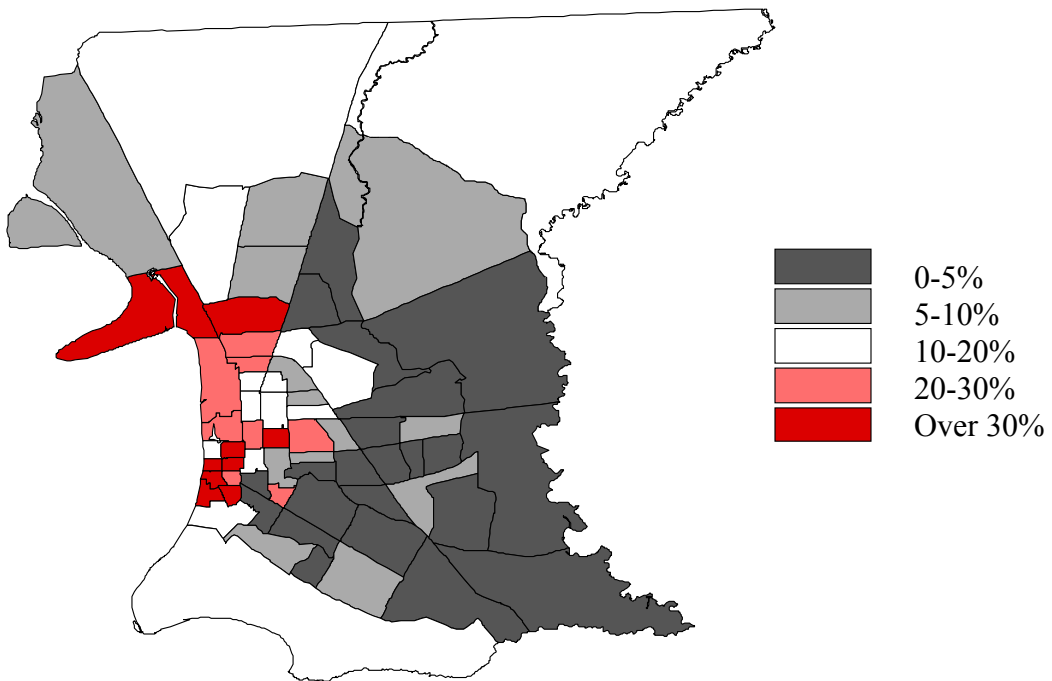
### 3.3.2 Poverty and Median Household Income

Changes within the parish also occurred among poverty and household income over the four census periods. Although the sheer number of people in the United States living in poverty are white (because most of the country is white), blacks are more likely to live in poverty than whites. Urban, inner-city areas where black residents tend to concentrate represent the highest poverty concentrations. Urban areas are becoming increasingly poverty stricken as middle-class black residents move out in less crowded and safer areas.

At the time of the 1970 census, poverty was higher in rural areas, the northern and southern parts of the parish. Parts of the inner-city area of EBRP had pockets of high poverty. Although poverty did concentrate in the inner-city area, the percentage of families living in poverty was not as high as in later census periods. By 1980, poverty began to concentrate in the inner-city area of the city of Baton Rouge, the same time in which the black population was also largely concentrated in or very near the downtown area. See Map 15 for 1970 poverty distribution and Map 16 for 1980 poverty distribution. In both census periods, areas of lower poverty were found in the parts of the parish with higher concentrations of white residents.



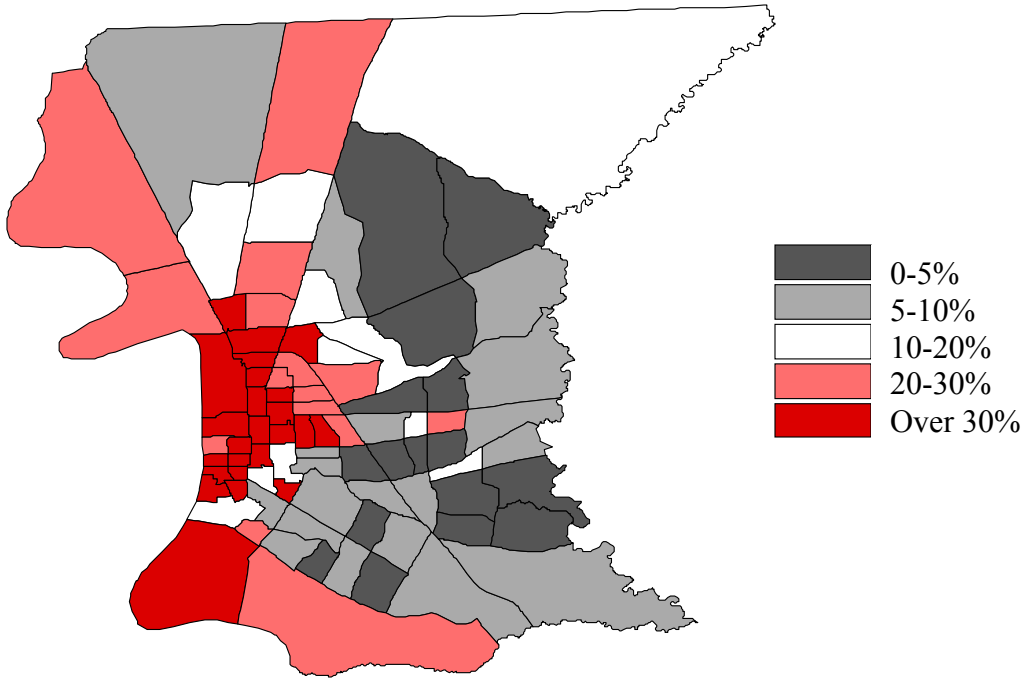
Map 3.15: Percent of families living below the poverty line in each census tract according to the 1970 census



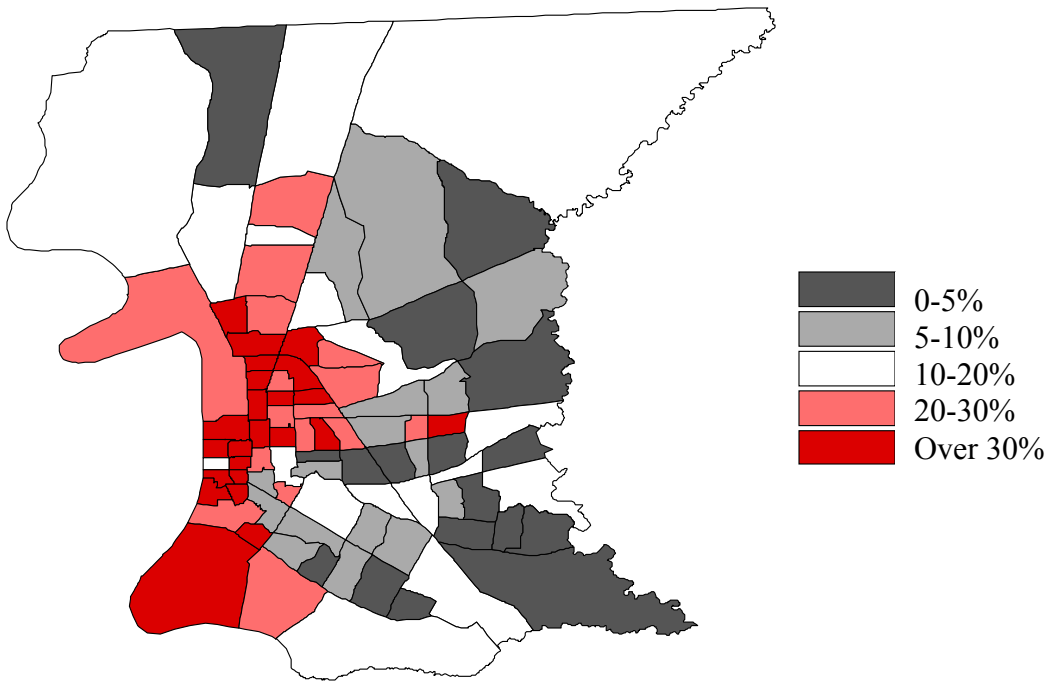
Map 3.16: Percent of families living below the poverty line in each census tract according to the 1980 census

The 1990 census data for poverty shows major changes in the distribution of poverty within EBRP. The inner-city area became very concentrated with all census blocks experiencing very high percentages of people living below the poverty line. It is important to note that the 1970 and 1980 census data for poverty are reported by families living below poverty whereas the 1990 and 2000 census data for poverty are reported as persons living below the poverty line. This difference in reporting could cause minor variations, but since people make up families, the results are still useful in showing a trend in concentrations of poverty within the parish. It is striking to see the increase in census tracts reported as having over 30% of residents living below the poverty line and the rapid change of other census tracts from lower percentages of residents living below poverty to higher percentages of residents living below poverty. However, the change in racial distribution of residents was also very rapid between the 1980 and 1990 census with many black middle-class families moving out of the inner-city, thus concentrating poverty as poor families were left behind. The same was experienced in Chicago after the explosion in the black population. As middle-class black residents began to move into the suburbs of the city, poverty concentrated in the inner city and at the same time, census tracts that previously had had lower rates of poverty began to display higher rates of poverty as the census tract became more and more black (Wilson, 1987). This is true in Baton Rouge as well—concentration of poverty occurred in the inner-city, and as the black population moved into the suburbs, poverty followed them. See Map 17.

In the 2000 census, the highest concentration of poverty was still in the inner-city of Baton Rouge, but poverty was spreading farther from the inner-city area. Several census tracts moved into the next higher breakdown of percentage of poverty. This shift



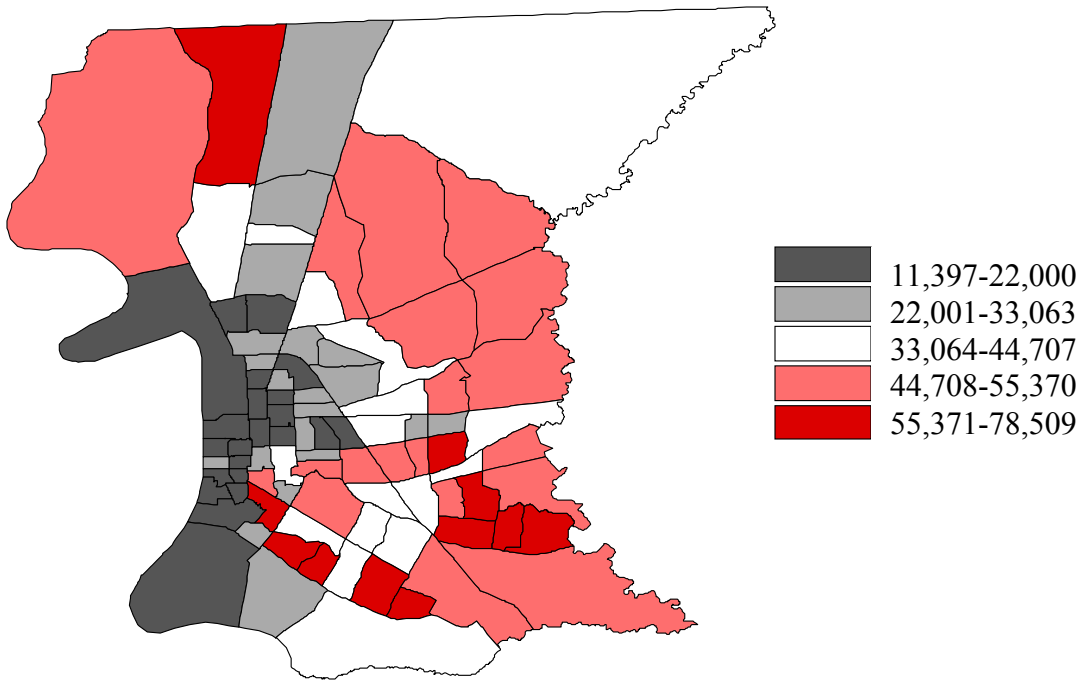
Map 3.17: Percent of families living below the poverty line in each census tract according to the 1990 census



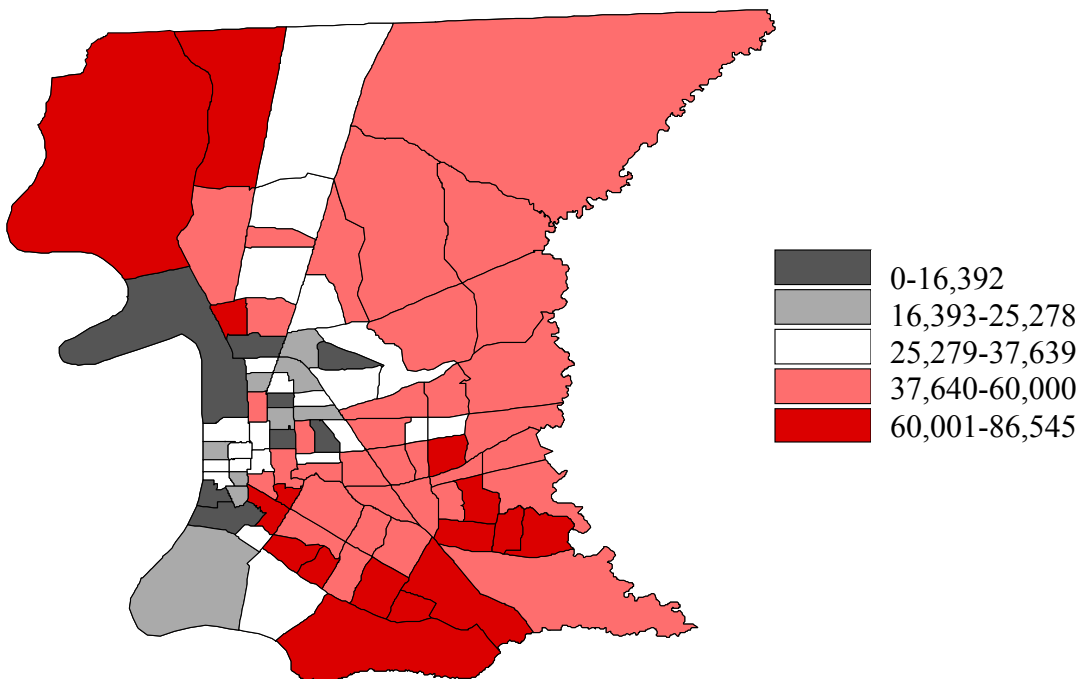
Map 3.18: Percent of families living below the poverty line in each census tract according to the 2000 census

of poverty into the suburbs corresponds with the migration of blacks out of the inner-city area, as does changes in median household incomes. In 1970, the parts of the parish with lower median household incomes were the rural areas and the inner city area. At the time of the 1980 census, the lowest median household incomes became more concentrated in the inner-city region of the parish. The concentration of lower median household incomes in the inner-city area remained through the 2000 census, though like with poverty, as the census tract became more black, it moved into lower rankings of median household income. Map 19 provides a visual of median household incomes from the 2000 census. Median household income also varied greatly by race. Black residents in EBRP had lower median household incomes values than white residents and when household income values were mapped, it is clear to see that black residents overall had more census blocks in the lower distributions of household income. Regardless of whether white or black, though, household incomes were lowest in the inner-city area. See Maps 20 and 21 for visuals of distribution of median household income by race.

As found in Chicago, areas in EBRP with higher concentrations of black residents are more likely to have higher rates of poverty than those with more white residents. There is also a demographic shift of black residents from the inner-city area of EBRP. Middle-class black residents are moving farther out of the inner-city area into what used to be predominately white middle-class neighborhoods. As this happens, more white residents leave those neighborhoods and settle into areas of new construction in farther out parts of the parish or into the neighboring parishes of Livingston and Ascension. As the census tracts experience a higher number of black residents, the rate of poverty in these census tracts also increase. It will be interesting to see upon completion of the 2010



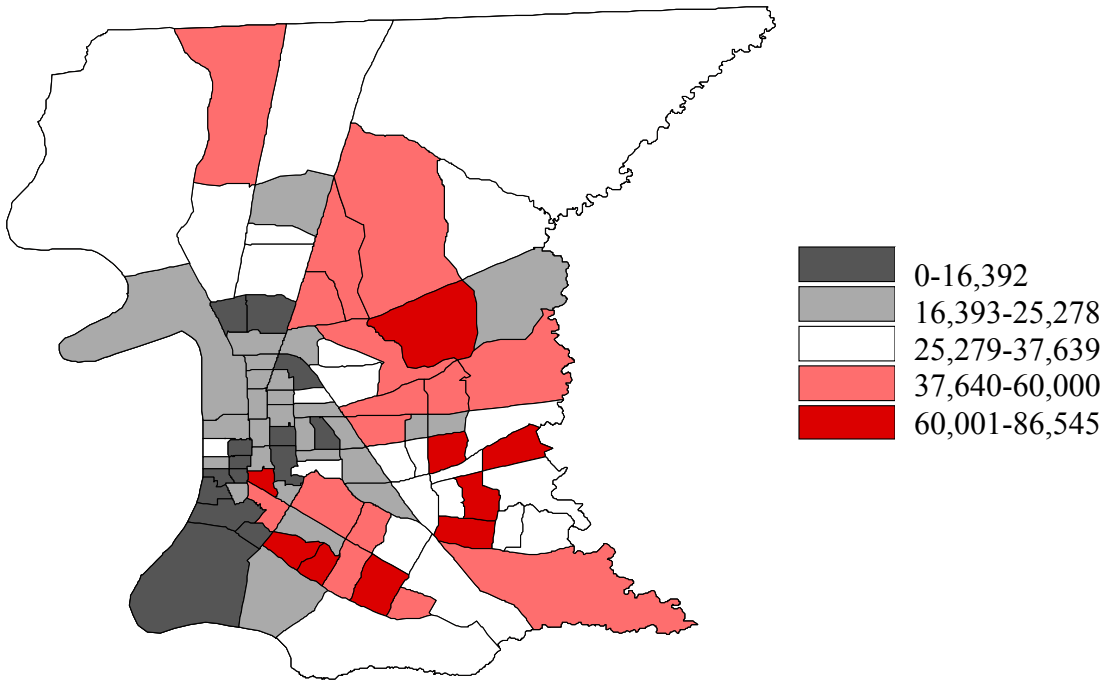
Map 3.19: Median household income in each census tract according to the 2000 census



Map 3.20: White median household income in each census tract according to the 2000 census

census if this trend continues. The trend displayed over the previous four census periods can be useful as a planning source for locations to place services that would best benefit the minority communities of East Baton Rouge Parish, especially with the debates over the future of Earl K. Long hospital in Baton Rouge.

Correlation analyses between the variables of percent black population and percent poverty were conducted for 1990 and 2000 census data at the tract and block group level. Spearman's correlation analysis was conducted in the SAS statistical analysis program. All four associations (1990 at block group level, 1990 at tract level, 2000 at block group level, 2000 at tract level) were found to be correlated. Spearman's correlation test for 1990 at the block group level was 0.80152. The Spearman's correlation for 1990 at tract level was higher at 0.81899. Correlations for the 2000 census period were also very high between percent living in poverty and percent black population in both geographic levels. Spearman's correlation for the association at the 2000 block group level was 0.76382 and the association at the 2000 tract level was found to be 0.78785. Association were slightly higher in both census periods at the tract level and all association were significant at the  $<0.0001$  level.



Map 3:21: Black median household income in each census tract according to the 2000 census

## Chapter 4: Birth Outcomes in East Baton Rouge Parish, Louisiana

### 4.1 Introduction

Birth certificate records for the years 1990 through 2001 were available for use in this dissertation project. Linked birth/death certificate records were available only for the years 1996 through 1998. Numerous unsuccessful attempts were made to obtain the linked birth/death certificate records for the years 1990 through 1995 and 1999 through 2001 from the Louisiana Office of Vital Statistics; as well as, birth certificate records prior to the year 1990 and after the year 2001. After the unsuccessful attempts, the intended research project was modified slightly with a focus placed on low birth weight and preterm delivery rather than infant mortality. Infant mortality will be discussed based upon the few records available for analysis.

Another concern in regard to the birth certificate records is the obvious data quality issues found while cleaning up the database. Fortunately, the fields in which the blatant inaccuracies were most evident are not vital to this research project; however, a reference does need to be made and some of the grossly evident errors will be discussed later in this chapter.

Collectively between the 1990 through 2001 birth certificate records, 75,170 birth certificates were available for analysis, with an average of 6264 births for each of the twelve years (range 5956-6600). Birth certificate records and death certificate records were provided at the address level, thus providing the ability to link the birth certificate record with data related to the demographics of the area in which the mother resided at the time of the birth. Birth certificate records were geocoded in ArcView GIS based upon the address provided; this geocoding was done by the LSU Geography Department.

Census tract and census block group borders/geographic identifiers were brought into the GIS and downloaded census data was imported and subsequently linked to the tract or block group geographical identifier. After that linkage, a spatial join linked the aggregate level demographic data from the census to each of the individual level birth certificate records for certain specified years. This spatial join was conducted at the census tract and census block group level for selected birth certificate records. More information will be provided in the section discussing the results of the multilevel analysis.

#### 4.2 Time Trend of Birth Outcomes: 1990-2001

The total number of births occurring in EBRP has been on a decline since 1990 when 6535 births occurred. In 2001, the total number of births was 5956 with most of the decline being found among births to white women. While the decline among the total or either race group has not been consistent throughout the years, the trend in the decline of the total number of births and births to white women is evident. The number of births to white women in the parish declined nearly each year from 3393 births in 1990 to 2614 births in 2001. The number of births to black women in the parish has not followed a consistent trend. Between 1990 and 2001, the births were almost split evenly between black women and white women. Of 75,157 births in which the mother's race was identified on the birth certificate, 36,397 (48.4%) were to white women and 36,981 (49.2%) were to black women. Only 1779 (2.4%) were to women identifying with a different race. See Table 4.1.

The number of women delivering multiple gestations has also increased, though the increase has been very small. In 1990, the number of single gestation deliveries was at the highest with 97.6% of deliveries being so. By 2001, the percentage of women

Table 4.1 Total Births and Births by Race in EBRP

	Total Births	White Total Births	Black Total Births
1990	6537	3393	3045
1991	6548	3294	3129
1992	6600	3385	3064
1993	6488	3285	3067
1994	6246	3110	2994
1995	6156	3127	2870
1996	6142	2966	3008
1997	6072	2870	3045
1998	6058	2828	3067
1999	6174	2848	3197
2000	6190	2677	3315
2001	5956	2614	3180

delivering only one infant had declined to the lowest point during the entire 12-year period with 96.1%. Numbers varied very little between races. This slight increase in multiple gestation pregnancies follows national data; the number of women having twins, triplets, or other multiples has increased over the past decade (Hoyert, D.L. et al. 2001).

Fertility rates have also declined during the twelve year study period. The fertility rate relates birth to the number of women in their childbearing years. The overall fertility rate of EBRP has declined from 75.7 per 1000 during the year 1990 to 72 per 1000 for the year 2000. The national fertility rate in 2000 was 67.6 per 1000 (Martin, J.A. et al. 2002). The fertility rate of white women was lower than that of black women in both 1990 (64.7 per 1000 versus 95.8 per 1000) and 2000 (58.2 per 1000 versus 89 per 1000). Fertility rates just presented are based upon the number of births during the year 1990 and 2000 respectively to women aged 15-39. The number of women residing in the parish during those years is based upon the results of the 1990 and 2000 census. Table 4.2 also provides a representation of fertility rates by age group. Fertility is down among teens in both races, while among white women, fertility increased in the age groups of 30-34, 35-39, and 40-44. These fertility trends by age group are representative of the national statistics in which teenage childbearing has decreased and childbearing among women older than 30 has increased (Martin, J.A. et al. 2002).

The statistics parish-wide for timely entry into prenatal care and complete prenatal care have also improved, though the percentage of women receiving no prenatal care has remained steady. The statistic related to prenatal care that showed the most marked improvement throughout the 12-year period is that of the total number of prenatal

Table 4.2 Fertility Rates Among EBRP Women of Reproductive Age

All		
Races	1990	2000
15-39	75.7	72
15-19	56.2	49.7
20-24	97.5	88.2
25-29	116.1	106.7
30-34	74.3	88.1
35-39	29.4	31.9
40-44	4.1	6.8
White	1990	2000
15-39	64.7	58.2
15-19	27.1	20.5
20-24	68.8	45.8
25-29	111.5	104.9
30-34	78.2	101.1
35-39	29.2	37.1
40-44	3.0	6.7
Black	1990	2000
15-39	95.8	89.0
15-19	97.9	82.1
20-24	148.0	145.1
25-29	124.0	108.8
30-34	67.9	70.9
35-39	29.8	25.7
40-44	6.2	7.0

Table 4.3 Total Number of Prenatal Visits Among EBRP Residents Delivering (%)

All Races	0	1-5	6-10	11+
1990	1.2	9.5	30.7	59.6
1991	1.7	9.0	31	58.2
1992	1.5	7.5	29	61.6
1993	1.3	7.4	28	62.8
1994	0.9	5.9	27.7	65.5
1995	1.1	5.6	24.4	68.9
1996	1.4	6.4	25.3	67.0
1997	1.3	6.0	24.0	68.5
1998	1.4	5.7	23.1	69.7
1999	1.3	5.1	23	70.5
2000	1.3	4.6	26.5	67.6
2001	1.3	4.4	22.6	71.7
White	0	1_5	6_10	11+
1990	0.2	2.5	19.4	77.9
1991	0.4	2.5	19.5	77.7
1992	0.3	1.8	18.0	79.9
1993	0.4	1.8	18.0	80.1
1994	0.4	1.7	17.8	80.2
1995	0.2	1.6	16.3	81.6
1996	0.3	1.7	15.0	83.0
1997	0.2	1.2	13.7	84.7
1998	0.4	1.4	12.8	85.2
1999	0.3	1.4	13.3	84.9
2000	0.4	1.2	15.9	82.5
2001	0.4	1.4	13.7	84.8
Black	0	1_5	6_10	11+
1990	2.4	17.5	43.2	26.8
1991	3.1	16.0	43.1	37.8
1992	2.8	13.8	42.0	41.4
1993	2.4	13.4	39.3	44.8
1994	1.6	10.1	37.9	50.5
1995	2.1	9.9	32.8	55.2
1996	2.4	11.2	35.0	51.4
1997	2.4	10.7	33.7	53.2
1998	2.3	9.9	32.1	55.7
1999	2.3	8.5	31.4	57.8
2000	2.1	7.3	34.7	56.0
2001	2.0	7.0	29.7	61.4

Table 4.4 Entry Into Prenatal Care Among EBRP Residents (%)

All Races	None	1st tri	2nd tri	3rd tri
1990	1.2	76.5	19.0	3.4
1991	1.6	76.6	18.6	3.2
1992	1.4	79.0	17.1	2.6
1993	1.3	78.2	17.8	2.7
1994	0.9	80.4	16.9	1.8
1995	1.1	83.4	13.5	2.0
1996	1.4	80.4	15.9	2.2
1997	1.3	80.9	15.6	2.3
1998	1.4	80.8	15.7	2.1
1999	1.3	79.8	16.6	2.2
2000	1.3	81.3	15.4	2.0
2001	1.3	81.4	15.3	2.1

White	None	1st tri	2nd tri	3rd tri
1990	0.2	89.6	9.0	1.2
1991	0.3	90.0	8.8	1.0
1992	0.3	91.1	7.8	0.4
1993	0.4	90.8	7.6	1.2
1994	0.4	91.3	7.7	0.7
1995	0.2	92.3	6.7	0.8
1996	0.4	91.5	7.3	0.8
1997	0.2	92.3	6.6	0.7
1998	0.5	92.2	7.0	0.4
1999	0.3	91.2	7.5	1.0
2000	0.4	92.7	6.2	0.7
2001	0.4	92.3	6.3	0.9

Black	None	1st tri	2nd tri	3rd tri
1990	2.3	61.5	30.3	5.9
1991	3.0	62.3	29.2	5.5
1992	2.7	65.0	27.7	4.7
1993	2.4	64.4	28.9	4.4
1994	1.5	68.6	27.0	3.0
1995	2.1	73.7	20.9	3.3
1996	2.4	69.1	24.8	3.7
1997	2.4	69.5	24.3	3.8
1998	2.3	69.8	24.2	3.7
1999	2.3	69.5	24.9	3.3
2000	2.1	71.9	22.9	3.1
2001	2.0	72.0	22.9	3.1

visits received by black women. In 1990, only 26.8% of the birth records of black women reported 11 or more prenatal visits; in 2001, that number had increased to 61.4%. This statistic also increased among white women though not as sharply. In 1990, 77.9% of birth records of white women reported 11 or more visits compared with 84.8% in 2001. Early entry into prenatal care also increased throughout the years for both races, but most noticeably among black women from 61.5% to 72% during the study period receiving prenatal care in the first trimester. The increase in early entry into prenatal care and total number of visits shows that not only are black women seeking out earlier prenatal care, but that they are also scheduling and/or keeping more appointments. Among white women, entry into prenatal care during the first trimester during the study period increased from 89.6% to 92.3%. The percentage of women receiving no prenatal care has remained steady both collectively and by race; however, there is a distinct disparity by race. Among all races, 1.3% of women received no prenatal care during the 12-year period, but among white women it was lower at 0.3% and higher at 2.3% among black women. See Tables 4.3 and 4.4.

When compared to national statistics on 1<sup>st</sup> trimester entry into prenatal care, EBRP was near the national average for each year within the study period. Nationwide in 1990, 75.8% of women received prenatal care in the 1<sup>st</sup> trimester compared with the 76.5% in EBRP for the same year. In 2000, the national average was 83.2% and the EBRP average was 81.3%. When separated by race, white women in EBRP were more likely than white women nationwide to enter into prenatal care during the 1<sup>st</sup> trimester (respectively, 89.6% versus 83.3% for 1990 and 92.7% versus 88.5% for 2000). Black women in EBRP and black women nationwide had similar rates across all years though

the trend for both was towards more black women entering prenatal care in the 1<sup>st</sup> trimester (Martin, J.A. et al, 2002). Compared to the state of Louisiana as a whole for the year 2000, white women in EBRP were slightly more likely than white women statewide to receive early prenatal care (92.7% versus 90.5% respectively) and black women in EBRP were slightly less likely than those statewide to receive early prenatal care (71.9% versus 73.6%) (ibid).

Educational attainment is an important consideration because it has been shown that women with higher educational attainment are more likely to receive timely prenatal care and also are more likely to have fewer negative lifestyle and/or health behaviors than those with lower educational attainment. In EBRP, the percent of women with less than a high school education has remained fairly steady throughout the years although black women are more likely than white women to have not completed high school (28.6% versus 8.9% respectively over the 12 year period). An increase has been seen among those with greater than twelve years of education in both races at the same time a decrease has occurred among those with only a high school diploma. Since the percentage of those without a high school diploma has remained fairly constant, the increase in those with more than twelve years of education could represent the trend of more women attending and/or graduating from college. In 1990, 41.9% of all women reported having greater than twelve years of education, with white women being highest at 53.8% and black women at 27.9%. By 2001, the percents of all groups had increased with all women representing 49.7%, white women 64.2%, and black women 35.5%. See Table 4.5.

Table 4.5 Educational Attainment Among EBRP Residents Delivering (%)

All Races	<12 Years	HS Diploma	>12 Years
1990	18.1	40	41.9
1991	18.9	38.7	42.4
1992	18.5	38.3	43.2
1993	19.3	37.4	43.2
1994	18.3	34.4	47.3
1995	17.9	34.3	47.8
1996	19.8	32.8	47.4
1997	18.2	32.9	49.0
1998	19.2	30.9	49.9
1999	19.0	31.4	49.5
2000	19.1	32.3	48.7
2001	18.9	31.5	49.7

White	<12 Years	HS Diploma	>12 Years
1990	9.3	36.9	53.8
1991	9.6	34.5	55.8
1992	9.8	33.6	56.6
1993	9.5	33.5	57.0
1994	8.1	30.2	61.7
1995	8.2	31.0	60.8
1996	10.1	28.1	61.9
1997	7.7	28.1	64.2
1998	8.5	25.0	66.5
1999	8.6	25.0	66.5
2000	7.7	26.1	66.2
2001	10.7	25.0	64.2

Black	<12 Years	HS Diploma	>12 Years
1990	28.0	44.1	27.9
1991	28.9	43.3	27.7
1992	28.3	44.5	27.2
1993	29.8	42.2	27.9
1994	28.9	39.4	31.7
1995	28.6	38.2	33.1
1996	29.4	37.6	33.0
1997	27.9	38.0	34.1
1998	29.1	36.2	34.7
1999	28.7	36.8	34.5
2000	28.3	37.6	34.1
2001	27.6	36.8	35.5

The percentage of women delivering preterm, moderately preterm, and very preterm infants has fluctuated throughout the study period though a definite decline or increase has not been seen in any race or as a whole. The preterm delivery rate of all women during the study years ranged from 9.6% to 11.9%. Among white women the range was 6% to 8.5%, and 13.7% and 16.6% among black women. Black women in EBRP have twice the change of delivering a preterm infant than white women. Compared to the national average, collectively all women in EBRP had rates similar to that of the national average (9.6% versus 10.6% for 1990 and 11.9% versus 11.6% for 2000). When separated by race, both white women and black women in EBRP had rates lower than that of the national average. In 1990, white women in EBRP delivered 6% of infants preterm compared with 8.5%; in 2000 it was 8.5% and 10.4% respectively. In 1990, black women in EBRP the percent was 13.7 compared with 18.9% nationally; in 2000, it was 14.8% and 17.4% respectively (Martin, J.A. et al. 2002). See Table 4.6.

Another statistic directly related to preterm delivery is low birth weight. Like with preterm delivery, rates fluctuated over the twelve year study period though there does appear to be a trend towards an overall increase, with the increase being among white infants. See Table 4.7. Compared to the national rates for white and black low birth weight, the rates for EBRP are similar; however, EBRP rates are lower than those of the state for low birth weight. In 2000, the rate for low birth weight among white infants in EBRP was 6.8%, for the nation it was 6.6% , and for the state of Louisiana, it was 7.4%. Among black infants in the same year, among EBRP births, the low birth weight percent was 13.3%, for the nation it was 13.1%, and for the state of Louisiana, it was 14.3% (ibid). The racial disparity for low birth weight at all three geographic areas

Table 4.6 Preterm Delivery Rates Among EBRP Residents Delivering (%)

All Races	<28 weeks	28-32 wks	33-36 wks	Preterm	37+ wks
1990	0.9	2.0	6.7	9.6	90.4
1991	1.1	2.2	7.8	11.0	89.0
1992	1.2	2.0	8.8	12.0	88.0
1993	1.4	2.1	7.4	11.0	89.0
1994	1.3	1.9	8.2	11.4	88.6
1995	1.4	2.2	8.2	11.8	88.2
1996	1.4	2.0	7.6	10.9	89.1
1997	1.3	2.3	8.3	12.0	88.0
1998	1.5	2.2	7.8	11.5	88.5
1999	1.3	2.1	7.6	11.0	89.0
2000	1.4	2.1	8.3	11.9	88.1
2001	1.4	2.4	7.5	11.2	88.8

White	<28 weeks	28-32 wks	33-36 wks	Preterm	37+ wks
1990	0.3	9.4	4.8	6.0	94.0
1991	0.4	1.0	5.5	7.0	93.0
1992	0.5	0.7	6.7	7.9	92.1
1993	0.9	1.2	4.8	6.8	93.2
1994	0.5	1.3	6.7	8.5	91.5
1995	0.4	1.2	6.7	8.2	91.8
1996	0.4	1.0	5.4	6.8	93.2
1997	0.2	1.0	6.2	7.5	92.5
1998	0.4	1.2	4.6	6.2	93.8
1999	0.4	1.3	6.0	7.7	92.3
2000	0.8	1.1	6.6	8.5	91.5
2001	0.8	1.5	5.9	8.1	91.9

Black	<28 weeks	28-32 wks	33-36 wks	Preterm	37+ wks
1990	1.7	3.2	8.8	13.7	86.3
1991	1.7	3.4	10.4	15.5	84.5
1992	2.0	3.4	11.2	16.6	83.4
1993	2.0	3.2	10.0	15.3	84.7
1994	2.2	2.7	10.0	14.8	85.2
1995	2.4	3.3	10.1	15.9	84.1
1996	2.4	3.0	9.9	15.2	84.8
1997	2.4	3.5	10.4	16.3	83.7
1998	2.5	3.2	10.9	16.6	83.4
1999	2.2	2.9	9.2	14.2	85.8
2000	2.0	3.0	9.8	14.8	85.2
2001	1.9	3.1	8.8	13.8	86.2

Table 4.7 Low Birth Weight Among EBRP Residents Delivering (%)

All Races	LBW	Not LBW
1990	9.8	90.2
1991	9.8	90.2
1992	10.1	89.9
1993	9.8	90.2
1994	10.5	89.5
1995	10.7	89.3
1996	10.1	89.9
1997	10.8	89.2
1998	10.6	89.4
1999	10.8	89.2
2000	10.4	89.6
2001	10.8	89.2

White	LBW	Not LBW
1990	5.6	94.4
1991	5.0	95.0
1992	6.2	93.8
1993	6.0	94.0
1994	5.7	94.3
1995	6.4	93.6
1996	6.1	93.9
1997	6.0	94.0
1998	5.6	94.4
1999	6.8	93.2
2000	6.8	93.2
2001	7.4	92.6

Black	LBW	Not LBW
1990	14.7	85.3
1991	15.1	84.9
1992	14.7	85.3
1993	14.2	85.8
1994	15.8	84.2
1995	15.4	84.6
1996	14.2	85.8
1997	15.4	84.6
1998	15.5	84.5
1999	14.6	85.4
2000	13.3	86.7
2001	13.8	86.2

(local, state, and national) is near 2.0. National rates for low birth weight have been on the increase since 1990. The national percentage of infants born of a low birth weight increased from 7.9% in 2003 to 8.1% in 2004. Since 1990, the national rate has increased 16% (kaisernetwork.org, 2005b).

Marital status was only available in birth certificate records for the years 1996, 1997, and 1998; these records were provided at a different time when all fields requested were provided. A huge racial disparity exists in this field. Many more white women in EBRP were married at the time of delivery than black women. Throughout all three years, the marital rates collectively and by race varied little. The overall marital rate for the three year period was 57.5% with 83.5% of white women married at the time of delivery and only 31.3% of black women. This large disparity results in more black children being born into female-headed households, a significant cause of poverty. As shown in Chapter 3, poverty is much more concentrated in parts of town with higher numbers of black residents.

Method of delivery is not associated with the low birth weight or preterm delivery rate, but it is a significant health indicator and a major Healthy People 2010 objective within the Maternal and Child Health component. The number of women nationally delivering by cesarean section has increased dramatically over the previous two to three decades and in 2004 reached an all time high of 29.1% of all births (ibid). The cesarean section rate of women in EBRP has fluctuated greatly from year to year, both collectively and when separated by race; this is unlike the national data which has experienced a trend with a consecutive increase in the rate of cesarean deliveries from 1990 onward towards 2004. The cesarean section rate over the eleven year period of 1990-2000 among EBRP

women when compared to national data is lower (16.9% versus 21.8%). In 2000, while the national average for cesarean delivery was 22.9% and the state average was even higher at 26.6%, the average for all EBRP women was unbelievably low at 8.2% (508 of 6190 deliveries). When separated by race for the year 2000, only 5.4% of EBRP white women were delivered by cesarean section; the rate among black women was 10.4%. Statewide in 2000, 27.2% of white women were delivered by cesarean and 26% of black women the same (Martin, J.A. et al. 2002). The percentage of cesarean section deliveries for EBRP residents in 2000 is so dramatically low and not consistent with the prior and next year's rates, that it raises concerns regarding the validity of the numbers.

The percentage of deliveries performed with the assistance of forceps or vacuum extraction is also much lower than that of the national average. In 1999, 7.4% of national deliveries were performed as a forceps and/or vacuum extraction delivery; among EBRP women, the rate was considerably lower at 1.8%. In 2000, the national average was lower at 7.0% as was the EBRP average of 1.7%. The percent of deliveries resulting from the use of forceps and/or vacuum extraction has declined nationally each year since 1994 with the reason being given that more obstetricians perform a cesarean delivery rather than use the forceps or vacuum extraction. This can clearly be seen in the national-level increase in cesarean section deliveries (Martin, J.A. et al. 2002; Kaisernetwork.org, 2005b). However, in EBRP parish in 2000, not only was the cesarean section delivery rate found to be at its lowest (8.2%) in years since 1994 when it peaked at 26.2% during the twelve-year study period, but the forceps and/or vacuum extraction delivery rate has also declined dramatically from 17.9% of all deliveries in 1994 to a twelve-year low of 1.7% in 2000. The EBRP rate for 2001 was 2.1% . The twelve-year high in EBRP was

Table 4.8 Method of Delivery Among EBRP Residents Delivering (%)

All Races	Vaginal	C/S	VBAC	Forceps	Vacuum
1990	84.0	15.7	1.7	12.0	3.0
1991	81.7	18.0	2.0	15.6	3.4
1992	82.2	17.7	1.7	17.1	5.2
1993	81.5	18.3	1.9	15.1	6.4
1994	73.5	26.2	2.0	10.7	7.2
1995	79.0	20.9	1.7	8.1	3.9
1996	83.2	16.6	1.5	4.4	1.8
1997	84.4	15.4	1.4	2.8	10.2
1998	84.5	15.4	1.4	2.8	1.2
1999	86.2	13.6	1.7	1.8	1.0
2000	91.5	8.2	1.4	1.1	0.6
2001	85.5	14.2	2.3	1.5	0.6
White	Vaginal	C/S	VBAC	Forceps	Vacuum
1990	82.3	17.6	1.7	16.8	4.4
1991	80.3	19.5	2.2	22.9	4.9
1992	83.7	16.2	1.6	24.4	7.4
1993	82.8	17.0	1.9	19.1	7.2
1994	72.3	27.4	1.5	14.1	7.8
1995	78.4	21.3	1.4	9.1	4.0
1996	84.1	15.5	1.0	5.0	1.1
1997	86.1	13.7	0.3	2.5	0.6
1998	86.5	13.6	0.4	2.6	0.8
1999	87.8	11.8	0.6	1.9	0.5
2000	94.2	5.4	0.5	0.6	0.4
2001	86.6	12.9	1.4	1.8	0.5
Black	Vaginal	C/S	VBAC	Forceps	Vacuum
1990	85.9	13.6	1.7	6.6	1.2
1991	83.1	16.5	1.8	7.9	1.9
1992	80.3	19.5	1.6	9.0	2.5
1993	79.9	19.9	1.9	10.7	5.3
1994	74.5	25.3	2.7	6.9	6.5
1995	79.3	20.6	2.1	6.9	3.6
1996	82.0	17.9	2.1	3.6	2.5
1997	82.8	17.0	2.4	3.1	1.3
1998	82.6	17.4	2.3	3.0	1.6
1999	84.5	15.4	2.7	1.7	1.3
2000	89.4	10.4	2.2	1.4	0.8
2001	84.4	15.5	3.0	1.3	0.7

22.3% in 1992. Simply stated, in the year 2000 in EBRP, 90.1% of all women had normal, unassisted vaginal deliveries when only 70.1% of women nationwide had the same. Taking into account the large difference between EBRP and national statistics on method of delivery and the prevailing cultural model of childbirth in the EBRP area being that of a medical model, these differences are most likely largely to under-reporting (whether intentional or unintentional) of cesarean, forceps, and vacuum extraction deliveries. See Table 4.8.

#### 4.3 Underreporting and Inaccuracies on EBRP Birth Certificate Records

Beyond the concern of the cesarean section, forceps, and vacuum extractions deliveries being underreported and not a true representation, discrepancies were found in other fields within the birth certificate records. Fields in which the errors were blatantly obvious were obstetric procedures and abnormal conditions of the newborn. Within the field of obstetric procedures, checkboxes were available on the birth certificate records for none, amniocentesis, electronic fetal monitoring (EFM), induction of labor, stimulation of labor, tocolysis, ultrasound, other, and unknown. More than one box could be checked if multiple procedures were performed. Unfortunately, certain procedures used more commonly than some of the ones listed as checkboxes, such as amniotomy, episiotomy, and epidural, were not available as checkboxes. Of the procedures listed, induction of labor and stimulation of labor were the ones analyzed for potential inaccuracies in the birth certificate record. For the field of abnormal conditions of the newborn, checkboxes were available for anemia, birth injury, hyaline membrane disease/RDS (respiratory distress syndrome), meconium aspiration syndrome, assisted ventilation <30 minutes, assisted ventilation  $\geq$ 30 minutes, seizure, none, and other. As

Table 4.9 Selected Rates for EBRP Women by Hospital of Delivery

1996			
	Induction	Stimulation	Any Abnormal Condition of Newborn
BRG	31/392=7.9%	3/392=0.8%	46/392=117.3 per 1000
EKL	71/1229=5.8%	224/1229=18.2%	25/1229=20.3 per 1000
LMH	38/171=22.2%	37/171=21.6%	8/171=46.8 per 1000
Woman's	7/4072=0.2%	3/4072=0.07%	37/4072=9.1 per 1000
EBRP	147/5864=2.5%	267/5864=4.6%	122/5864=20.8 per 1000
1997			
	Induction	Stimulation	Any Abnormal Condition of Newborn
BRG	3/552=0.5%	0/552=0%	61/552=110.5 per 1000
EKL	150/1208=12.4%	200/1208=16.6%	9/1208=7.45 per 1000
LMH	36/216=12.7%	25/216=11.6%	8/216=37.0 per 1000
Woman's	10/3940=0.25%	2/3940=0.05%	16/3940=4.1 per 1000
EBRP	199/6003=3.3%	227/6003=3.8%	99/6003=16.5 per 1000
1998			
	Induction	Stimulation	Any Abnormal Condition of Newborn
BRG	3/475=0.6%	0/475=0%	56/475=117.9 per 1000
EKL	148/1198=12.3%	287/1198=24%	15/1198=12.5 per 1000
LMH	16/216=7.4%	14/216=6.5%	11/216=50.9 per 1000
Woman's	15/4016=0.4%	0/4016=0%	8/4016=2.0 per 1000
EBRP	182/5905=3.1%	301/5905=5.1%	93/5905=15.7 per 1000

with obstetric procedures, more than one box could be checked. Birth certificate records for the years 1996, 1997, and 1998 were used because these years were the only years in which the hospital code for place of birth was given, and large differences in reporting were found among hospitals in EBRP. The field for hospital of birth was not available in the records for the years 1990 through 1995 and 1999 through 2001 because they were obtained at a later date and the field was not provided to us. National statistics for the year 1996 and 1997 are referenced for induction of labor and stimulation of labor (source Curtin, S.C. and Park, M.M. 1999), and 2000 statistics are referenced for abnormal conditions of the newborn (source Martin, J.A. 2002). Table 4.9 references EBRP statistics in this section.

In 1996 among EBRP residents, the percentage of birth certificate records documenting an induction of labor was 2.5% (147/5864). The national average during that year was 16.9%. In 1997, the disparity between the local and the national average was also high with 3.3% (199/6003) in EBRP and 18.4% nationally. The 1998 average for EBRP was 3.1% (182/5905). For stimulation of labor, disparities were also noted. In 1996, the local average was 4.6% and the national average was 16.9%. For 1997 the rates were 3.8% (local) and 17.4% (national). The local rate for 1998 was 5.1%. When the field of obstetric procedures was stratified by hospital of delivery, local discrepancies were found. In 1996, Baton Rouge General Hospital (BRG) documented induction occurring in 7.9% (31/392) of their deliveries. Earl K. Long Hospital (EKL) had a rate of 5.8% (71/1229), Lane Memorial Hospital (LMH) had a rate of 22.2% (38/171), and Woman's Hospital had only 7 EBRP residents out of 4072 (0.17%) who delivered there

recorded as having their labor induced. This stratification places only LMH anywhere near the national average of 16.9% for 1996.

For the obstetric procedure of stimulation of labor, disparities were also found among hospitals for the year 1996. Both EKL with a rate of 18.2% (224/1229) and LMH at 21.6% (37/171) were nearer the national average of 16.9% than the other two hospitals. BRG posted three labor stimulations of labor out of 392 (0.8%) deliveries. Woman's also posted three stimulations; however, their denominator was 4072 giving a percent of only 0.07. As stated in section 2.5, in studies of accuracy of the birth certificate record, induction and stimulation of labor was found to be grossly underestimated on birth certificate records; and based upon the individual hospital's statistics after the stratification, it is evident that serious underreporting is occurring.

The years 1997 and 1998 also found huge differences among hospitals within EBRP. In 1997, BRG had an induction rate of 0.5% (3/552), EKL's was 12.4% (150/1208), LMH's was 12.7% (36/216), and Woman's was 0.25% (10/3940). The stimulation rates for 1997 were 0% (0/552) for BRG, 16.6% (200/1208) for EKL, 11.6% (15/216) for LMH, and 0.05% (2/3940) for Woman's Hospital. In 1998, induction rates were 0.6% (3/475) for BRG, 12.3% (148/1198) for EKL, 7.4% (16/216) for LMH, and 0.4% (15/4016) for Woman's. The stimulation rates for 1998 were 0% (0/475) for BRG, 24% (287/1198) for EKL, 6.5% (14/216) for LMH, and 0% (0/4016) for Woman's Hospital. While browsing through the results found for obstetric procedures, although ultrasound was not a field analyzed for potential discrepancies, I couldn't help but notice that in 1997 of all 552 EBRP residents delivering at BRG, only one woman was

documented on the birth certificate as having received an ultrasound during her pregnancy.

Table 4.10 provides a quick reference for hospitals having rates similar to the national average. In Table 4.10, any hospital with a rate higher or not less than 25% lower than the national average has an X marked in square represented by field and year. For the 1996 rates, the bottom margin for receiving an X was 12.675% for induction and stimulation; for 1997, the numbers were 13.8% for induction and 13.05% for stimulation. The 1997 rates were used in place of 1998 rates for this calculation. Based upon these comparisons, only EKL and LMH had rates found somewhat consistent with the national statistics. EKL's stimulation rate was near or higher than the national average for all three years. In 1996, LMH's induction and stimulation rate were above the national average.

Abnormal condition of the newborn is reported in national statistics as the number per 1000 live births. As previously stated, checkboxes were available for anemia, birth injury, hyaline membrane disease/RDS (respiratory distress syndrome), meconium aspiration syndrome, assisted ventilation <30 minutes, assisted ventilation  $\geq$ 30 minutes, seizure, none, and other. As with obstetric procedures, more than one box could be checked. In 2000 among national statistics, the rate of any abnormal conditions among newborns was 43.7 per 1000 with ranges of 0 (fetal alcohol syndrome) to 22 (assisted ventilation <30 minutes) per 1000 depending upon the specific condition. In EBRP, the rate for all abnormal conditions in 1998 combined was 15.7 per 1000. In 1997, the combined rate was 16.5 per 1000 and in 1996, it was 20.8 per 1000. Significant disparities were found among hospitals. In all three years, BRG posted the rate for

Table 4.10 Similarity to National Statistics

	1996	
	Induction	Stimulation
BRG		
EKL		XXXXXXXX
LMH	XXXXXX	XXXXXXXX
Woman's EBRP		
	1997	
	Induction	Stimulation
BRG		
EKL		XXXXXX
LMH		
Woman's EBRP		
	1998	
	Induction	Stimulation
BRG		
EKL		XXXXXX
LMH		
Woman's EBRP		

abnormal conditions of the newborn at over 110 per 1000 for each of the years. The rates were 117.3 per 1000 in 1996, 110.5 per 1000 in 1997, and 117.9 per 1000 in 1998. LMH posted the next highest rates for abnormal conditions with 46.8 per 1000 in 1996, 37 per 1000 in 1997, and 50.9 per 1000 in 1998. The two local hospitals with NICU's, Earl K. Long and Woman's, posted the lowest rates of abnormal conditions of the newborn. EKL posted rates of 20.3 per 1000 for 1996, 7.45 per 1000 for 1997, and 12.5 per 1000 for 1998. Woman's Hospital posted the lowest rates of all with 9.1 per 1000 for 1996, 4.1 per 1000 for 1997, and 2.0 per 1000 for 1998. The specifics of the conditions listed on the births at Woman's Hospital were evaluated. Collectively for the three years, only 63 abnormal conditions were noted out of 12,014 records (two infants had multiple conditions). According to birth certificate records, only 0.6% of all infants born there had respiratory distress, need for assisted ventilation, seizures, anemia, birth injury, meconium aspiration syndrome, or any other condition. Of the 63 conditions noted, two were anemia, three were birth injuries, two were meconium aspiration syndrome, two were assisted ventilation, 40 were seizures, and 14 were marked as other. No records indicated respiratory distress syndrome/hyaline membrane disease, common problems associated with preterm delivery and a cause for many infants being placed in neonatal intensive care. Clearly these birth certificates were not completely filled out.

While serious discrepancies and concerns were found in the fields of obstetric procedures and abnormal conditions of the newborn, an assumption can not be made that the majority of the birth certificate records is correct. As stated in Chapter 2, many of the fields related to demographics, birth weight, and gestational age are correct. For the research in this dissertation, most of the fields used in the analyses have been found in

studies regarding accuracy of the birth certificate record to be correct. A system needs to be established that requires hospitals to be more comprehensive and correct in the transferring of information from the medical record to the birth certificate record; I am confident that such a system exists in the insurance billing departments of these hospitals.

#### 4.4 Infant Mortality: A Significant Racial Disparity

Infant mortality (IM) in EBRP has a higher racial disparity than any of the other birth outcomes typically measured. In EBRP, the racial disparity is typically around 4:1 in any given year with four black infants dying for each white infant that dies. Linked birth/death certificates were only available for the years 1996, 1997, and 1998. As previously stated, many obstacles with the vital statistics division prevented more years from being obtained. The IM rate is also available through the Baton Rouge Healthy Start program for infant deaths within their study project area for years 1999, 2000, and 2001. Their study area is one with a higher concentration of low income and black residents than the rest of the parish, so it is not intended to be a representative sample of the entire EBRP population rather just a reference.

Between 1996 and 1998, 213 infants born in EBRP died, of which 41 were white and 170 were black. The IM rate for the parish was 11.3 per 1000, for white infants in the parish it was 5.0 per 1000, and for black infants it was 15.0 per 1000. The racial disparity for the IM rate was 3.0. EBRP had the highest rate among all parishes in Region 2 of the OPH state regional categorization; the other parishes in Region 2 are Ascension (9.4), East Feliciana (10.4), Iberville (10.8), Pointe Coupee (7.9), West Baton Rouge (10.0), and West Feliciana (8.9). In the Healthy Start project area, the IM rate in 1999 was 13.04 per 1000 (15.07 among black infants, no white infant deaths), in 2000 it

was 12.09 per 1000 (13.37 among black infants and 4.4 among white), and in 2001, it was 15.38 per 1000 (16.48 among black infants and 4.7 among whites).

Deaths associated with multiple gestation was more common among black infants than white infants. Of the 20 deaths among twins or triplets, 19 of those were black infants. Of the 170 black deaths, 11.2% were among multiple gestations compared to 2.4% among white infants. During the years 1996-1998, 257 (46.7%) of the twin or triplet births were to white women and 296 (53.3%) were to black women. This shows a racial disparity in infant deaths due to multiple gestation.

When several maternal and infant characteristics, such as mother's age, mother's marital status, mother's prenatal care, mother's education, infant's birth weight, and infant's gestational age was stratified, racial disparities were evident within the strata. This stratification also provides information on which maternal or infant characteristics are most related to a higher infant mortality rate. However, significance can not be drawn from the stratification analysis because for many of the stratifications, the sample of the population resulted in a small denominator that chance could have played a large role in the rate provided. This is especially true among, for example, the subgroup of IM among white women receiving no prenatal care; the IM rate was 0/1000, but only 29 women were in that strata. Because of the small numbers, this section is descriptive and all IM rates are per 1000.

The IM rate was highest among younger mothers and older mothers. Among all women 19 and younger the IM rate was 15.7 (7.3 among whites and 18.4 among blacks) and for women 40 and over the IM rate was 16.0. However, the racial disparity (RD) among teen mothers was the lowest of all age groups at 2.5. This follows what many

studies have said that although teenage mothers are more likely to experience the death of an infant, the racial disparity is the lowest in this age group. The age group with the highest racial disparity of 10.4 was 35-39 year olds. The IM rate among black women did not vary much between age groups (18.4 for 19 and under, 16.3 for 20-24, 21.8 for 25-29, 21.3 for 30-34, and 19.7 for 35-39). Among white women, the IM rate was highest among teens (7.3) and next highest among women 40 years and over (27.5). For the other age groups of white women, the IM rate varied between 1.9 and 5.4. The RD was highest at 10.4 among 35-39 year old. See Table 4.11.

Among not married women, the IM rate was higher collectively (17.2) and by race with the white IM rate among non married women being 6.3 and among black women 19.6 when compared to married women (7.8 for all, 4.4 for white, and 16.5 for black). However, the RD was higher among married women (3.8) than unmarried women (3.1).

While the IM rate among all women, white women, and black women declined as the total number of prenatal visits increased, so did the RD. The RD was highest in the group of women receiving the most prenatal visits. Among women receiving 16 or more prenatal visits, the RD was 4.9, among women receiving 11-15 visits it was 2.5, with 6-10 visits it was 1.7 and there was no racial disparity among women receiving 1-5 visits. The IM rates and RD seen with the month prenatal care began was rather unexpected. The IM rates among black women was, as expected, highest among women receiving no prenatal care (74.1), but among black women beginning prenatal care in the first trimester, the IM rate was 19.5, higher than that of black women beginning care in the second trimester (10.3) or the third trimester (11.8). White women beginning prenatal

Table 4.11 Mother's Age and the Corresponding IM Rate and RD

Mother's Age	White			Black			Total Rate per 1000	Racial Disparity
	# Deaths	# in Strata	Rate per 1000	# Deaths	# in Strata	Rate per 1000		
<=19	5	687	7.3	40	2172	18.4	15.7	2.5
20-24	5	1555	3.2	50	3066	16.3	11.9	5.1
25-29	15	2766	5.4	43	1975	21.8	12.2	4.0
30-34	9	2433	3.7	26	1219	21.3	9.6	5.8
35-39	2	1031	1.9	11	557	19.7	8.2	10.4
40+	5	182	27.5	0	131	0	16	

Table 4.12 Number of Prenatal Visits and the Corresponding IM Rate and RD

Number Prenatal Visits	White			Black			Total	Racial Disparity
	# Deaths	# in Strata	Rate per 1000	# Deaths	# in Strata	Rate per 1000	Rate per 1000	
0	0	29	0	16	216	74.1	65.3	
1-5	8	124	64.5	62	964	64.3	64.4	0
6-10	11	1196	9.2	48	3056	15.7	13.9	1.7
11-15	21	5880	3.6	36	3982	9.0	5.8	2.5
16+	1	1414	0.7	3	879	3.4	1.7	4.9

Table 4.13 Month Prenatal Care Began and the Corresponding IM Rate and RD

Month Prenatal Care Began	White			Black			Total Rate per 1000	Racial Disparity
	# Deaths	# in Strata	Rate per 1000	# Deaths	# in Strata	Rate per 1000		
0	0	31	0	16	216	74.1	64.8	
1-3	33	7948	4.2	123	6321	19.5	10.9	4.6
4-6	7	602	11.6	23	2224	10.3	10.6	0.9
7-9	1	56	17.9	4	339	11.8	12.7	0.6

care in the second trimester and third trimester had higher IM rates than those of black women (11.6 and 17.9 respectively). However, as stated previously, because of small numbers, no significance can be drawn from these descriptive statistics. The RD in IM among women beginning prenatal care in the first trimester was 4.6. See Tables 4.12 and 4.13.

Collectively among all women and when separated by race, the IM rate was lower among women with a high school diploma (HSD) or higher; however, the RD was lowest among women with less than a HSD. This relates to the lower RD yet higher IM rate among teenaged mothers. Among white women with a HSD or higher, the IM rate was less than half that (4.3) of women with less than a HSD (9.2). The IM rate among black women with a HSD (19.1) or higher (16.2) was also less than that of those with less than a HSD (20.6), but the lowest RD of 2.2 was among women with less than a HSD. For women with a HSD the RD was 4.4 and for women with higher than a HSD it was 3.8. The RD among low birth weight infants that died was 1.7; however, over 2.5 times as many black infants (1372) were born low birth weight as white infants (514). Among infants not born at a low birth weight, the RD was higher at 3.8. It also needs to be noted that many more of the infants that died at a very low birth weight were black instead of white. Of the 117 deaths that were of a very low birth weight (<1500 grams), 103 were black infants and only 14 were white infants. Black infants were also much more likely to have been born at a very low birth weight than white infants. See Table 4.14

When looking at stratification by gestational age, infants born at less than 28 weeks gestation had a RD of 1.2, and among infants born at 29-32 weeks and 33-36 weeks, the IM rate was lower among black infants than white infants. At 29-32 weeks,

the IM rate among black infants was 44.2 and 63.2 among white infants; at 33-36 the IM rates were 5.2 among black infants and 10.7 among white infants. But once the infants reached term, the RD favored white infants again. The IM rate for term white infants was 2.4 and for black infants it was 7.7; thus, giving a RD of 3.2. This supports literature stating the notion that preterm black infants have a survival advantage to preterm white infants. See Table 4.15. Table 4.16 lists the IM rates discussed in this section as well as corresponding national rates. The EBRP IM rates are for 1996-1998; the national rates are for 1996. Rates for 1997 and 1998 were similar.

#### 4.5 Risk Factors for Preterm Delivery and Low Birthweight

The analysis for this section was completed in two parts. The first part was an analysis to determine odds ratios for preterm delivery and low birthweight as well as, stratification by potential confounders found on the birth certificate record. The second part was a multilevel analysis in the form of a regression. The multilevel analysis included several risk factors from the odds ratios/stratification analysis that were found to be potential confounders and two fields from the census data. More census fields such as % female headed household, % residents owning their home, and mobility of residents were unable to be included because of being unable to obtain the data from the census bureau. The fields from the census data that were included at the aggregate level were % black population and % residents under the poverty line. Four multilevel regressions were conducted—one each for 1990 at the block group level, 1990 at the tract level, 2000 at the block group level, and 2000 at the tract level. For the analyses in 1990, birth certificate records from 1990, 1991, and 1992 were spatially joined to the census data; and for 2000, birth certificate records from 1999, 2000, and 2001 were spatially joined to

Table 4.14 Lowbirth weight and the Corresponding IM Rate and RD

	White			Black			Total Rate per 1000	Racial Disparity
	# Deaths	# in Strata	Rate per 1000	# Deaths	# in Strata	Rate per 1000		
LBW	27	514	52.5	120	1372	87.5	61.3	1.7
NLBW	14	8150	1.7	50	7748	6.5	4	3.8

Table 4.15 Gestational Age and the Corresponding IM Rate and RD

Gestational Age	White			Black			Total Rate per 1000	Racial Disparity
	# Deaths	# in Strata	Rate per 1000	# Deaths	# in Strata	Rate per 1000		
<28 weeks	11	31	354.8	98	221	443.4	432.5	1.2
29-32 wks	6	95	63.2	13	294	44.2	48.8	0.7
33-36 wks	5	468	10.7	5	947	5.2	7.1	0.5
37+ wks	19	8070	2.4	59	7658	7.7	4.9	3.2

Table 4.16 EBRP IM Rates for 1996-1998 and National IM Rates for 1996 by Race

	White EBRP 1996- 1998	White National 1996	Black EBRP 96-98	Black National 1996
IM	5.0	6.1	15	14.1
LBW	52.5	57.5	87.5	78.7
NLBW	1.7	2.5	6.5	3.7
<28 wks	354.8	424.0	443.4	405.7
<37 wks	37.0	32.6	79.3	57.2
37+ wks	2.4	2.7	7.7	4.7
PNC 1st tri	4.2	5.5	19.5	12.9
PNC 2nd tri	11.6	6.8	10.3	11.2
PNC 3rd tri	17.9	6.0	11.8	8.8
No PNC	N/A	26.3	74.1	49.9
<19	7.3	8.9	18.4	14.5
20-24	3.2	6.9	16.3	13.7
25-29	5.4	5.3	21.8	13.8
30-34	3.7	5.0	21.3	14.2
35-39	1.9	5.7	19.7	15.0
40+	27.5	7.2	N/A	17.0
<12 yrs ed	9.2	12.3	20.6	27.0
HSD	4.3	6.4	19.1	13.8
>HSD	4.3	4.0	16.2	10.5
Married	4.4	5.3	16.5	12.1
Unmarried	6.3	8.2	19.6	15.0

the census data. The results from the SAS analysis on odds ratios and potential confounders will be discussed first.

The odds ratio/stratification analysis was run first with race of black being the risk factor and preterm delivery being the outcome; the second analysis was also with race of black being the risk and low birthweight being the outcome. Stratification was performed for the potential confounders of number of previous deliveries, mother's age, interval between pregnancies, education, smoking, use of alcohol, trimester entry into prenatal care, mother's weight gain during pregnancy, and multiple gestation. Previous deliveries was stratified on three levels—no previous deliveries, one to five previous deliveries, and more than five previous deliveries. Mother's age group was stratified on five levels—less than 17 years, 18-19 years, 20-29 years, 30-39 years, and 40 or more years. Interval between pregnancy was stratified on four levels—less than eighteen months, nineteen through 36 months, 37-72 months, and more the 72 months. Mother's education was on three levels—less than a high school diploma (HSD), HSD, or more than a HSD. Smoking, use of tobacco, and multiple gestation were yes or no. Entry into prenatal care was none or beginning in the 1st, 2<sup>nd</sup>, or 3<sup>rd</sup> trimester. Mother's weight gain was stratified on less than 19 pounds, 20-39 pounds, 40-59 pounds, and more than 59 pounds. For this analysis, all birth records from the years 1990-2001 were grouped together for a total of 73,378 births.

The odds ratio for a black woman delivering a preterm infant was 2.2383. The most profound confounders were mother's education, entry into prenatal care, and mother's weight gain. Surprisingly, infants of single gestation had a higher OR for preterm delivery (2.5571, 95% CI, 2.4231, 2.6986) than multiple gestations (1.3573, 95%

Table 4.17 Odds Ratio for stratification and controlling for black delivering preterm

OR for no previous deliveries	2.0468
OR for 1-5 previous deliveries	2.3102
OR for >5 previous deliveries	2.715
OR for previous deliveries controlled	2.2062
OR for mother's age <18	2.0677
OR for mother's age 18-19	1.7722
OR for mother's age 20-29	2.1433
OR for mother's age 30-39	2.5595
OR for mother's age 40+	2.7854
OR for mother's age controlled	2.2272
OR for pregnancy interval <19 months	2.125
OR for pregnancy interval 19-36 months	2.6739
OR for pregnancy interval 37-72 months	2.4649
OR for pregnancy interval >72 months	2.6125
OR for pregnancy interval controlled	2.2312
OR for mother's education <12 years	1.9959
OR for mother's education 12 years	2.1487
OR for mother's education >12 years	1.9883
OR for mother's education controlled	2.0506
OR for mother smoking	2.8319
OR for mother not smoking	2.2052
OR for mother smoking controlled	2.2631
OR for mother drinking	2.2776
OR for mother not drinking	2.247
OR for mother drinking controlled	2.2474
OR for prenatal care entry = no PNC	2.1598
OR for prenatal care entry = 1st trimester	2.088
OR for prenatal care entry = 2nd trimester	2.0542
OR for prenatal care entry = 3rd trimester	2.1899
OR for prenatal care entry controlled	2.0863
OR for weight gain <20 pounds	2.1254
OR for weight gain 20-39 pounds	2.1051
OR for weight gain 40-59 pounds	1.7555
OR for weight gain >59 pounds	0.8021
OR for weight gain controlled	2.0541
OR for single gestation	2.5571
OR for multiple gestation	1.3573
OR for gestation controlled	2.4229

Table 4.18 Odds Ratio for stratification and controlling for black delivering LBW

OR for no previous deliveries	2.5018
OR for 1-5 previous deliveries	2.7413
OR for >5 previous deliveries	4.0738
OR for previous deliveries controlled	2.645
OR for mother's age <18	2.4638
OR for mother's age 18-19	1.9484
OR for mother's age 20-29	2.5782
OR for mother's age 30-39	3.0316
OR for mother's age 40+	2.9151
OR for mother's age controlled	2.6363
OR for pregnancy interval <19 months	2.461
OR for pregnancy interval 19-36 months	3.4623
OR for pregnancy interval 37-72 months	3.1227
OR for pregnancy interval >72 months	3.7379
OR for pregnancy interval controlled	2.6503
OR for mother's education <12 years	1.9723
OR for mother's education 12 years	2.4832
OR for mother's education >12 years	2.5257
OR for mother's education controlled	2.3895
OR for mother smoking	2.7909
OR for mother not smoking	2.6876
OR for mother smoking controlled	2.7002
OR for mother drinking	2.0898
OR for mother not drinking	2.6771
OR for mother drinking controlled	2.668
OR for prenatal care entry = no PNC	1.8632
OR for prenatal care entry = 1st trimester	2.6149
OR for prenatal care entry = 2nd trimester	1.997
OR for prenatal care entry = 3rd trimester	2.2313
OR for prenatal care entry controlled	2.4998
OR for weight gain <20 pounds	2.3011
OR for weight gain 20-39 pounds	2.5658
OR for weight gain 40-59 pounds	2.0176
OR for weight gain >59 pounds	1.2979
OR for weight gain controlled	2.3967
OR for single gestation	3.0883
OR for multiple gestation	2.3725
OR for gestation controlled	3.0168

CI, 1.1436, 1.6109). The results for controlling on the confounders as well as the OR from the stratification for preterm delivery are displayed in Table 4.17.

The odds ration for a black woman delivery a low birthweight infant was 2.6518, higher than that for preterm delivery. The most profound confounders for low birthweight were similar to that for preterm delivery; they were mother's education, entry into prenatal care, mother's weight gain, and multiple gestation. As with preterm delivery, single gestation infants had a higher OR for low birthweight (3.0883, 95% CI, 2.9118, 3.2756) than multiple gestation infants (2.375, 95% CI, 1.9831, 2.8382). The results for controlling on the confounders as well as the OR from the stratification for low birthweight are displayed in Table 4.18.

Multilevel regressions were conducted incorporating risks associated with preterm delivery and low birth weight. All variables mentioned previously that were controlled and stratified for were incorporated into the multilevel regressions along with the census provided variables of percent black residents and percent of people living below the poverty line. Multilevel regression for both the outcome of low birthweight and preterm delivery were conducted. The census provided variables were spatially joined to the geocoded birth certificate records with the spatial join function in ArcView 3.2. The spatial join linked each geocoded birth certificate records (a dot on the map) with the census block group and census tract it was located in. The data from the census bureau website was linked along with the geographic identifiers, so along with each mother's individual characteristics on the birth certificate, certain variables associated with her social/"neighborhood" environment could be included in the regression. The birth certificate records for 1990, 1991, and 1992 were spatially joined with 1990 census data

at the block group level and then again at the tract level so that multilevel regressions could be conducted on two geographic levels. The Spearman's correlations presented in Chapter 3 found that the correlation between percent black residents and percent residents living below poverty had different correlations at the different geographic levels, so it can be assumed that the effect of the social environment on birth outcomes could vary with the geographic level. For the 2000 census data, 1999, 2000, and 2001 birth certificate records were spatially joined at the census block group and census tract level. This allowed a total of four multilevel regressions to be conducted for the each of the outcomes of low birthweight and preterm delivery. Going into this analysis, it was hypothesized that the social/neighborhood characteristics of percent black residents and percent poverty would be found to have a significant effect on birth outcomes, if not a greater effect than some of the mother's individual characteristics. Both low birthweight and preterm delivery were entered into the model as a categorical variable as was the variable of mother's race. All other variables were entered as continuous.

For each multilevel regression that was conducted (8 in total), the percent of the population that was black was found to be significant. For all four multilevel regressions conducted using 1990, 1991, and 1992 birth records with 1990 census data at block group (90-92 BG) and tract level (90-92 tract), the variables of mother's race, mother's education, month prenatal care began, and percent black population were found to be significant predictors. For the four multilevel regressions conducted with 1999, 2000, and 2001 birth records with 2000 census data at the block group (99-01 BG) and tract (99-01 tract) level, the same four variables proven significant in the earlier time period were also found to be significant. The variable of percent residents living in poverty was

thrown out of the regression because of its high correlation with percent black population. Only the significant variables will be discussed.

In every multilevel regression except 1999-2001 at the block group and tract level for preterm delivery, race of the mother was found to be the most significant predictor of low birthweight and preterm delivery based upon Wald chi square statistic. In the 1999-2001 regressions at the block group and tract level, mother's education was found to be the most significant predictor based upon Wald chi square statistic for preterm delivery. The variable of percent black population ranked 3<sup>rd</sup> or 4<sup>th</sup> in each multilevel regression that was conducted; I had expected this variable to be placed higher in the model though it was significant in each model. Results for the multilevel regression Wald chi square and P values are provide in Tables 4.19 and 4.20.

Wald chi square values for the variable of percent black population was higher and more significant for 90-92 BG and 90-92 tract for both low birthweight and preterm delivery. In the multilevel regression of 90-92 tract, percent black residents had the 3<sup>rd</sup> highest Wald chi square value. Wald chi square values for 90-92 BG and 90-92 tract with both low birthweight and preterm delivery were also higher than those for 99-01 BG and 99-01 tract. Significance was very high for all variables in the model that were above the  $P=0.05$  that would have resulted in the variable not being placed into the output for the regression model. Although it was expected that the social environment characteristic of percent black population would have ranked higher in the regression model, the results do show that for both geographic levels and for both census periods, the social characteristic of degree of racial segregation does play a role in low birthweight and preterm delivery.

Table 4.19 Multilevel regression results for low birthweight

Low Birthweight		
1990-1992 Block Group		
	Wald chi square	P value
Race group	75.986	<0.0001
Mother's education	45.0451	<0.0001
Month prenatals	18.2137	<0.0001
% black	15.5805	<0.0001
1990-1992 Tract		
	Wald chi square	P value
Race group	82.6964	<0.0001
Mother's education	45.1697	<0.0001
% black	18.9531	<0.0001
Month prenatals	18.2713	<0.0001
1999-2001 Block Group		
	Wald chi square	P value
Race group	50.7732	<0.0001
Mother's education	42.2956	<0.0001
Month prenatals	22.5487	<0.0001
% black	6.8555	0.0088
1999-2001 Tract		
	Wald chi square	P value
Race group	60.2273	<0.0001
Mother's education	42.3047	<0.0001
Month prenatals	22.9588	<0.0001
% black	7.2843	0.007

Table 4.20 Multilevel regression results for preterm delivery

Preterm Delivery		
1990-1992 Block Group		
	Wald chi square	P value
Race group	59.5483	<0.0001
Mother's education	21.5373	<0.0001
Month prenatals	16.7718	<0.0001
% black	15.0075	<0.0001
1990-1992 Tract		
	Wald chi square	P value
Race group	64.7031	<0.0001
Mother's education	21.5846	<0.0001
% black	18.568	<0.0001
Month prenatals	16.8395	<0.0001
1999-2001 Block Group		
	Wald chi square	P value
Mother's education	51.1014	<0.0001
Race group	29.8416	<0.0001
Month prenatals	13.9101	0.0002
% black	6.4756	0.0109
1999-2001 Tract		
	Wald chi square	P value
Mother's education	51.1341	<0.0001
Race group	35.4632	<0.0001
Month prenatals	13.5714	0.0002
% black	7.233	0.0072

## Chapter 5: Summary and Findings

### 5.1 Summary of Research Findings

The intent of this dissertation research was to determine the demographic changes of the East Baton Rouge Parish population and to determine racial disparities in birth outcomes. While this may not seem to be related, these two topics are. As the demographics of a population changes, the disparities in the population will subsequently change. In Chapter 3, the results that showed how the EBRP population had changed from 1970 to 2000 were presented. During these four census periods, the inner-city area of EBRP became blacker and poorer while the suburbs flourished. As this happened, poor birth outcomes concentrated in the area as well and the parish began to experience not only a racial disparity, but a concentration of poor birth outcomes due to the racial and socioeconomic segregation. As the years passed, the poor blacks left in the inner-city became more and more isolated. The impact of this on birth outcomes was shown in Chapter 4. Results of multilevel regressions found that the characteristics of the neighborhood environment has an impact on birth outcomes—the blacker the neighborhood, the more likely a mother is to deliver preterm or have a low birthweight baby, regardless of her individual characteristics or risks. If more years of birth certificate records would have been available, earlier years would have shown, based upon trends shown in Chapter 3, that negative birth outcomes would have been less clustered in the inner-city area of EBRP. As the clustering and concentrated segregation of black residents in the inner-city continues, poor birth outcomes will continue to concentrate in the areas of the poorest and least privileged residents. What has happened in EBRP has been experienced in other major cities such as Chicago, Illinois and Detroit,

Michigan and in some smaller urban cities, the process EBRP is currently experiences is beginning—one of these smaller urban cities where this process is beginning is Manchester, New Hampshire. This dissertation research adequately proved that the EBRP population is undergoing a demographic shift, that birth outcomes are worse in less advantaged census tracts, and that the trend of racial and socioeconomic segregation will continue.

## 5.2 Strengths of this Study and the Data

The strengths of this study were the availability of four census periods of data for poverty, racial distribution, and median household income, the large number of birth certificate records available, and the number of years of birth certificate records available. The fields used from the birth certificate records were those consistently found to be most reliable—mother’s race, age, and education status, and the infant’s birthweight and gestational age. This study was also beneficial because it revealed areas in which birth certificate records for EBRP are grossly inaccurate; this could prompt better quality assurance during the process of quality control checking of the data. Because twelve years of birth certificate records were available, analysis using data from two different census periods were available for multilevel regression analysis. While this study was successful in showing demographic changes, racial disparities in birth outcomes, and the effect of the social environment on birth outcomes, many struggles and frustrations were experienced throughout the study. Had data acquisition gone as originally planned, the results from this dissertation would have been more comprehensive and possibly stronger. This next section discusses some of the frustrations experienced during this

research project and the next steps that will be taken to improve upon the work already done.

### 5.3 Setbacks, Frustrations, and the Next Step

I feel it is important to have a section discussing some of the setbacks I experienced while working on this dissertation. Obtaining data topped the list. Census data from 1990 and 2000 is available online; however, the tables are very incomplete, an example is for female-headed households. The information available on the Census Bureau Factfinder site provides information that when added together gives the user the numerator based upon adding tables that aren't exactly what you asked for and may or may not be the correct number of female-headed households in that geographic area—but the denominator is not given and trying to determine the denominator by adding and taking the value from different columns such as the one that provides women by race by age does not represent the correct denominator. Unfortunately this was not discovered until after I spent a considerable amount of time cleaning up the dataset downloaded from the internet. Rather than proceeding and using a denominator that was similar though not the correct one, many census variables that I would have liked to have used in the analysis for both Chapter 3 and Chapter 4 could not be used. Some of the fields I would like to have been able to include were female-headed households, married head of household families, number of people per room in the home, mobility between census periods, work status, means of transportation to work, and educational attainment.

Prior to my decision to downsize the intensity of the demographic change analysis I would have liked to perform, the US Census Bureau was contacted about performing a special run for the fields listed above as well as a few others that I would like to have

considered using. This special run would have provided the numerator and denominator for each field in any level of aggregation and stratification that I would have wanted; however, this option would have cost a sum of up to 10,000 dollars. This sum of money was not available and I had to do the demographical analysis for Chapter 3 with only the percentage of black residents in each geographic area, the percentage of residents under poverty in each geographic area, and the median family income and median home value. While the use of these limited variables did show that a trend does exist, that this type of analysis can be done, and that there has been a profound shift in the racial and socioeconomic segregation and movement within the parish, the availability of the other fields would have made that chapter much more comprehensive. I will acknowledge though that after finishing the chapter on demographic changes within the parish, I did discover a more reasonably priced method of obtaining the census data by purchasing census DVD's from a company called GeoLytics. Funding was secured for the purchase of these DVD's, but Hurricane Katrina caused delays and by the time I finally received the DVD's and managed to get them installed, Chapter 3 had been completed for many months, the entire dissertation project was near completion, and I was in a different state starting a new job. Time did not allow me to rerun and expand the entire analysis for Chapter 3.

For 1970 and 1980 census data, the data was available in book format only (unless paying the US Census Bureau to conduct pricey special runs) and the data had to be entered into an Excel spreadsheet by hand. Obviously this is a time consuming option. This problem was also solved with the purchase of the Census DVD's; however, as stated earlier, time became an issue. After consulting with my major professor, we reached the

conclusion that I could not justify spending several additional months redoing analysis and rewriting the chapter.

Through the Healthy Start program, I received authorization for birth and birth/death linked records from 1990 through current. We were first given 1996-1998 birth and birth/death linked records followed much later, and only after much discussion, by birth records for 1990-1995 and 1999-2001. We were also given the birth/death linked files for those years, but after opening the birth/death linked files that were sent, we realized they were not in a usable format. One would think that since we had been given authorization and had received the files, but in a “scrambled” format, that it would be a simple process solved by a phone call to get the correct files but that was not the case. Numerous phone calls, emails, and reminders later we still had not received the data. Jimmy Guidry, the health director for LA OPH region that encompasses Baton Rouge assisted by getting me in touch with the correct person to get the data, but it still didn’t come quickly or easily. Many months later, I finally received a CD with the 1990-1995 and 1999-2001 birth/death linked files as well as birth and birth/death linked files for subsequent years, but the CD was never finalized so I could not read the files. About a month after this, Hurricane Katrina hit and the entire OPH system was disrupted. It was decided that I should do the analysis to the best of my ability with what I had. This required changing the scope of what I would like to have done to what I could do with what I had available. This was essentially dropping analysis on infant mortality and performing the analysis with older birth certificate records. The analysis for Chapter 4 was also affected by the problems associated with getting the census data because the

multilevel regressions used both individual level birth records and aggregate level census data in the analyses.

While the research presented in this dissertation was limited by issues related to data access, there is much potential for future work. The census data is now available through the DVD's and future analysis on demographic trends and changes can incorporate many more variables than presented in this dissertation. Discussion is also taking place with researchers at the LSUHSC School of Public Health, the State University of New York System University at Albany School of Public Health, and Rutgers University to expand the GIS I developed for East Baton Rouge Parish to include data on air quality. Poor air quality has been linked with poor birth outcomes such as low birthweight, preterm delivery, intrauterine growth retardation, infant mortality, and SIDS. My new position with the Environmental Health Tracking Program in New Hampshire (funded by a CDC grant) includes initiating a pilot project looking at air quality (AQ) in Manchester, NH and birth outcomes (BO). Other large cities in New Hampshire may be added later to the pilot study. For the pilot project looking at AQ and BO, I will be developing a GIS identical to what I developed for my dissertation analysis and incorporate into it, the new dimension of AQ data from several different sources both spatially modeled and unmodeled. While I am developing the GIS for Manchester, NH, the methodology needed to test associations between AQ and BO will be conducted on the EBRP GIS I developed since it is only missing the component of AQ. The Environmental Protection Agency (EPA) has available for download through the National Air Toxics Assessment, modeled ambient concentrations for 33 pollutants obtained from the Toxic Release Inventory, and the Louisiana Department of

Environmental Quality has data collected from air monitoring stations within EBRP. This data can be incorporated into the EBRP GIS to test causal factors between AQ and BO. The availability of census data at the aggregate level and individual data from the birth certificates along with the air quality data will allow for a complex multilevel regression model to test various potential risk factors. Because the birth records are at the address level, analysis can also be conducted to determine if close proximity to a road and the air pollutants associated with that play a role in poor birth outcomes. The state of Louisiana has an Environmental Public Health Tracking Program funded through the CDC as well and the EPHT programs are being encouraged by the CDC to collaborate together on pilot and research projects; if the Louisiana EPHT program agrees to work with me on the Baton Rouge air quality project, they could assist by obtaining additional years of birth and birth/death linked certificates.

After completion of the Manchester, NH GIS a study will be done comparing the two urban cities. It is known that Louisiana consistently ranks among the worst in the nation in terms of birth outcomes and that New Hampshire ranks among the best in the nation. Discussion is in place on how to do a comparison between these two urban cities to determine why there is such a significant difference in birth outcomes.

Because of the large number of geocoded birth certificate records and the inclusion of census data, this dissertation project has the ability to be expanded into numerous other projects beyond those listed. Study can also be conducted on racial and socioeconomic segregation and the impact of it on various birth outcomes such as low birthweight and preterm delivery; most of the data is already in the EBRP GIS created; only a few additional census variables would need to be added. Spatial statistical

analyses could be done to determine if the demographic shifts found are significant predictors of birth outcomes. Future study can also be done on the impact of Hurricane Katrina on the demographics of the parish. It is hoped that after meeting with potential collaborative researchers that these future studies will occur.

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## Appendix: Definitions

Unevenness refers to the distribution of blacks and whites across neighborhoods in an urban area, specifically the degree to which each neighborhood has the same proportion of blacks to whites as does the urban area overall.

Isolation refers to the average probability of contact at the neighborhood level between blacks and whites.

Clustering refers to ghettoization, that is, the degree to which black neighborhoods are contiguous to one another as opposed to dispersed across the metropolitan area.

Centralization refers to the degree to which black neighborhoods are located near the metropolitan area's central city as opposed to its suburbs. The dimension of centralization is relevant in the US context, in particular, because segregated minorities are concentrated in central cities, which are typically the oldest, most dilapidated, and most socioeconomically deprived part of the metropolitan area.

Concentration refers to the population density experienced by the segregated group across the metropolitan area relative to the density experienced by other groups.

Taken from Acevedo-Garcia, D. and Lochner, K. 2003.

## Vita

Misty Richard has been a student at Louisiana State University longer than she would like to admit to. She has received a bachelors, two masters, and a doctorate from the Louisiana State University system. She is now employed with the Environmental Public Health Tracking Program, a CDC funded program within the New Hampshire Department of Health and Human Services. She is their environmental epidemiologist and is currently leading projects on demographic changes in Manchester, New Hampshire, birth defects, the association between arsenic in the drinking water and bladder cancer, the association between arsenic and birth outcomes, as well as the association between air quality and birth outcomes. Her research interests include racial and socioeconomic disparities, migration of populations, environmental justice, midwifery, and maternal/child health. Prior to moving to New Hampshire, she was a member of the Louisiana Advisory Committee on Midwifery.

During her years as a student, Misty has also raced on a semi-pro adventure racing team and traveled through the southern US competing. Though currently “retired” from racing, she still maintains a competitive edge and plans to compete in less intense sports. She is the mom of Michaela and still feels that her daughter is her greatest accomplishment in life.