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This study provides an initial examination of predictors of differences of infant mortality between African-Americans and Whites. Guided by Wilkinson's theory, it was hypothesized that income inequality among the population is a significant predictor of infant mortality disparities. A number of socioeconomic and health services variables were used in this study to control for the effects of income inequality on the dependent variable. Findings suggest that income inequality of a county is not a direct predictor of higher infant mortality of African-Americans than Whites. However, the association of inequality and IMR gap varies based on the metropolitan status of the county. Insurance status was found to have a negative effect on IMR gap, which implies the importance of including variables other than related to access (such as, quality of care) in future research.

INCOME INEQUALITY AND RACIAL

DISPARITIES IN INFANT MORTALITY IN TEXAS COUNTIES

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THESIS

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CHAPTER I

INTRODUCTION

The purpose of this study is to explain the racial disparities of infant deaths that have been persistent throughout the U.S. history. Among the very young, the racial gaps are perhaps best manifested in the inequality of mortality rates. The rate of 13.5 for Black infants is almost three times as high as the rate of 5.7 for non-Hispanic White (CDC, 2002). This leads to an inevitable question. How can this racial gap in infant mortality be explained? Guided by Wilkinson's theory (1997) my hypothesis is that income inequality among the population is a significant predictor of infant disparities. I will use county level data of Texas from 1999 to 2001 to test my models. I expect that the findings of my study will provide a better understanding of how to reduce disparities of health.

Since the mid-1980s a growing body of epidemiological and public health research demonstrated that mortality risks are higher in areas where income inequality is high compared to egalitarian areas. Recent cross-sectional studies of states and even countries conducted from the 'income inequality' perspective indicate that low income itself may not be a problem; rather relative deprivation may be an issue. Wilkinson's theory is a groundbreaking work in this regard. According to his theory, absolute income levels are no longer important in the developed world. He claims that the higher mortality rates are a result of relative poverty, rather than a result of absolute poverty. Wilkinson

gives primacy to the concept of relative deprivation. Inequality leads to decline of 'social cohesion' or 'trust' and the negative emotions are translated into poor health through psycho-neuro-endocrine as well as through stress-induced behaviors.

The consistent earning gap between Whites and African-Americans (for example, in 1997, per capita income of Americans was $12,351 compared to $20,425 for Whites) points to the fact that if Wilkinson's theory is correct, then the effects of inequality may be more strongly experienced by the African Americans compared to the Whites. Three theoretical perspectives will be considered in this study: income inequality, theory of healthy lifestyle and the role of technology. The purpose of this ecological study is to test whether income inequality when controlled for SES can explain the excess of infant mortality of the African-Americans. All of the 254 counties of Texas will be included in this study.

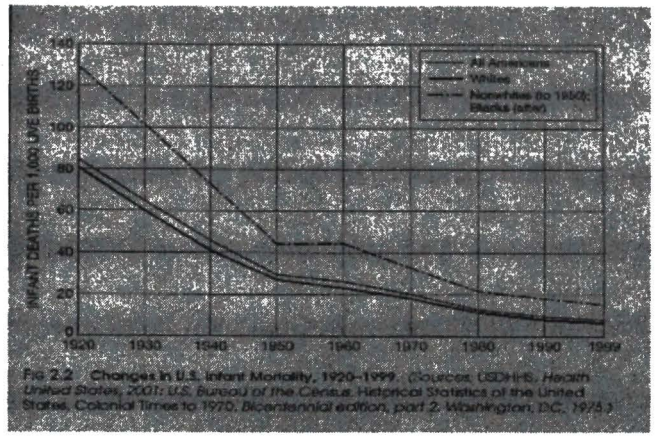
Problem Statement and Background

The focus of this study is the higher rates of infant mortality of the African-Americans than the Whites. Overall in U.S. in the 2000 infant mortality rate was 6.9 per 1,000 live births. There have been a deep decline in infant mortality rate during the 20th century; however, the rate for blacks is always almost twice the rate for whites (Figure 1). In 1915, approximately 100 white infants per 1000 live births died in the first year of life; the rate for black infants was almost twice as high. In 2000, the rate of 13.5 for infants of Black is more than twice as high as the rate of 5.7 for non-Hispanic White (CDC, 2002).

MMMR (7/12/2002) reports that although infant mortality declined 45% for all races during 1980-2000 (from 12.6 to 6.9 deaths per 1000 live births), the decline was

greater for whites than for blacks. During this period, infant mortality among Blacks declined 36.9% while for whites the decline was 47.7% This reports points out two important determinants of racial/ethnic differences in infant mortality: low birth weight (defined as, 2500 grams), and very low birth weight (<1500 gms). Over time, for both the categories, whites had greater decline. Whites birth weight-specific mortality decreased 49.4% for low birth-weight infants and 41.6% for very low birth-weight infants. On the other hand, for blacks, birth weight-specific mortality decreased 38.0% for low birth-weight infants and 28.4% for very low birth-weight infants. There are considerable ethnic differences in birth-weights. Blacks had the highest rate of both pre-term and very pre-term delivery, followed by Mexican-Americans, Asians, and Whites (Shino & Klebanoff, 1976; Iyasu et al., 1992).

Figure 1. Changes in U.S. infant mortality, 1920-1999



Graph Source: Freund, P.E.S., M.B. McGuire, and L.S. Podhurst. 2003. *Health Illness and the Social Body.* Prentice Hall, New Jersey, p. 19.

According to the Texas Department of Health, in Texas in 2002, 12.5 percent of white women lacked prenatal care in the first trimester, compared to 28.8 percent of Hispanic women and 23.7 percent of African American women. Allen et al. (1987) observed that seventy-two percent of the higher IMR in the South was due to higher proportion of black births compared with the remainder of the nation.

This higher rates of infant mortality among the African-Americans not only indicates poorer health status of this minority population, but also are merely outward manifestations of underlying race differentials in political, social, and other aspects. Specially, infant mortality from 1 month to 12 months is not much due to medical problem as much as it is due to social pathologies. A nation's strengths of health care system are reflected in how it takes care of the weaker members - the infants and the elderly. In 1996, the U.S. ranked 26th among industrialized countries for infant mortality rates (U.S. Census Bureau, 2001). This ranking is misleading since there are wide

disparities among racial groups which are shocking denunciation of living conditions for segments of the population in the richest country of the world.

SES has been examined as a predictor of mortality by a numerous research without much success in explaining the persistent disparate rates among ethnic and racial minorities. This study is focused to some promising new directions in infant mortality research, such as how the degree of inequality when controlled for SES and role of technologies affects racial disparities in infant mortality rates. Considerable increases in income and wealth inequality have been reported in the United States during the past 10 to 15 years (Wolff, 1994). Inequality in income has increased in all states except Alaska between 1980 and 1990 (Kaplan & Elsie, 1999). Though there is no consensus about the causes, 21% of this increase was attributed to increases in stock prices relative to housing. From 1983 to 1989, 66% of the total gain in net financial wealth was received by the top 1%, and 37% by the next 19% of the population, and the bottom 80% lost 3% (Wolf, 1994).

One of the goals of Healthy People 2010 is to reduce disparity of health status among the races. Proper understanding of the mechanisms through which infant mortality results is essential to achieve this goal. The theoretical proposal of Wilkinson that income inequality is a predictor of mortality in developed countries will be the major theoretical guide for this research.

Theoretical Perspectives

A number of theories have been proposed to explain health disparities. Epidemiologists have long been tried to explain etiology of illness and mortality from a macro level perspective. Medical sociologists have added valuable knowledge to this with their unique sociological perspective that focuses on not only the micro but also macro level social forces. Three recent major theories will be considered in this study to explain the disparate burden of health within a population: relative Income theory, healthy life style theory, and role of technology.

Income Inequality Perspective

In infant mortality research so far researchers have used median income or per capita income as a predictor, but during the last 20 years cross-national studies consistently show that the extent of inequality within a country is closely tied to the health profile. From the 'income inequality' perspectives, researchers claim that ecologic units with a more egalitarian income distribution will have a better health profile than units with large income inequalities. One of the major proponents of the income inequality perspective is Wilkinson (1996). Wilkinson's theory attributes the mortality of developed countries more to the effect of relative than absolute living standards. He presents three sets of evidences to support this theory. Firstly, the regular gradients between income and mortality within countries contrast sharply with the much weaker relation found in the differences between rich developed societies. Secondly, cross-sectional data show that even after average incomes, absolute poverty, and a number of other socioeconomic factors have been controlled for; mortality tends to be lower in

societies where income differences are smaller. Thirdly, Wilkinson argues that there are indications that the epidemiological transition represents a stage in economic development after which further improvements in material standards have less influence on health.

In a cross-national study, Wilkinson and Lobmayer (2000) examined age- and sex-specific mortality among 14 Organization for Economic Co-operation and Development (OECD) countries in relation to income inequality, median income and absolute and relative poverty. They found that a wider income distribution is related to higher premature mortality. Relations with inequality appear to weaken at ages over 30, and after age 65 the signs of relationships reverse. According to this study, this relationship tends to be strongest for infant mortality.

The pathways of this effect, as Wilkinson focuses, are indirect effects of psychological circumstances. These include increased exposure to behavioral risks resulting from psychosocial stress, including any stress related smoking, drinking, eating 'for comfort,' etc, while most of the direct effects are likely to centered on the physiological effects of chronic mental and emotional stress. One explanation of why greater income equality is associated with better health, according to Wilkinson is it improves social cohesion and decreases social divisions.

Wilkinson's theory stimulated a number of promising research explaining why certain groups in a society experience greater burden of disease and death than others. Using state-level data Kennedy et al (1998) examined the effect of state-level income on individuals' self-rated health and found that individuals living in states in the highest

quartile of income inequality were more likely to report poor or fair health than individuals living in the most egalitarian quartile. This result remained significant even after controlling for SES indicators. Loncher et al. (2001) tested whether this effect of income inequality at the state-level is related to individual mortality risks. They found that individuals living in the high-income-inequality states were at increased risk of mortality compared to individuals living in low-income-inequality states. Though they did not find any effect on Black men at any income level, for the near-poor Black women the relative risks associated living with higher-income-inequality states ranged from 1.26 to 1.64.

Franzini et al. (2001) in a study on Texas counties tested Wilkerson's theory, and demonstrate that the risk of death was lower in counties with more equal income distribution than in counties with less equal income distribution. Consistent with Wilkerson's theory, they found an association of inequality and mortality that persisted after adjusting for median income, college graduates, and number of hospital beds in counties with bigger population (at least 150,000), but not in counties with smaller population.

McLaughlin & Stokes (2002) suggested a complex relationship between minority concentration, income inequality, and county-level mortality rates. Higher income inequality at the county level was significantly associated with higher total mortality. When level of income inequality, per capita income and household size are controlled for, counties with high concentrations of Blacks have higher mortality for all ages of Blacks. They found a clear gradient of mortality with income inequality. Percentage of

Blacks is associated with higher mortality rates, and that the influence of inequality declines as the percentage of Blacks increases.

LeClere et al. (2000) focused on demographic groups and found no corresponding association of income inequality and morbidity for Blacks of all ages. This was opposite to their hypothesis that African Americans are likely to be most affected by the geographic manifestations of income inequality, because they are most likely to live in poor and marginal neighborhoods. However they claimed that their result might have been dominated by the young and middle-aged Whites, as in the analysis they represented more than 69% of the sample.

Though a number of studies have been conducted comparing geographic areas with differential investment in structural and economic resources and human capital, few of them directly focus on income inequality. Collins & David (1992) observed that although adequate prenatal care was associated with improved birth weight distribution independent of community income, only in moderate-income areas it was related to black neonatal survival. For black infants who received adequate prenatal care, residence in impoverished areas was associated with a nearly fourfold greater neonatal mortality rate.

The importance of including the confounding variables to understand the underlying causal mechanisms of income inequality and mortality has been pronounced in some research. Brodish et al. (1993) found a weak, yet consistent and direct associations between all-cause mortality and income inequality among the 100 counties of North Carolina. They controlled for age and per capita income, but suggested that more factors need to be controlled to explore the mechanisms, for example, the density of

physicians and level and proximity of emergency medical services available to the county residents.

Stockwell et al. (1995) examined two sets of broad causes of infant death: endogenous causes or those most directly associated with the physiological processes of gestation and birth (e.g., congenital anomalities, low birth weight), and exogenous causes, or those whose origin are located in the external environment (e.g., pneumonia, infectious and parasitic diseases, accidents). They conclude that both these causes have underlying economic cause, and it is difficult to isolate the relative influences of each. This is because not only the persons in lower income groups do not receive the same quality of care that the affluent members of society receives, but also because the general level of living of persons in lower income groups, as well as their behavior patterns are often detrimental to infant survival.

Race-specific very-low-birth weight rates are lowest among infants with parents who experience positive income incongruity at multiple levels (Collins et al., 1997). The very-low-birth weight rate among infants born to African-Americans who experience positive income incongruity is less than half of that for infants born to African-American women who received an adequate number of prenatal care visits. Psychophysiological stress related to discrimination and social isolation could partially contribute to these higher rates among the African Americans. Brooks (1980) indicates that the neonatal and postneonatal mortality rates were strongly determined by low-birth weight. His study shows that racial composition and low family income are social and economic variables

that primarily relate to neighborhood infant mortality rates through the effects of low birth weight.

Polednak (1991) in a study on 38 large US metropolitan areas examined Black-White difference in infant mortality rate in 38 large standard metropolitan statistical areas (SMSAs) in relation to socioeconomic status indicators and an index of residential segregation. He found that Black-White infant mortality rate and the association with the segregation index is apparently independent of variation of the Black-White difference in poverty prevalence. He concludes that among the many potential explanations for higher infant mortality rates in the segregated areas of SMSAs in California, availability and use of diagnostic/treatment procedures, level of training and attitudes of providers, and patient decision-making should be examined.

In a later study Polednak updated the above research (1996) and concluded that Black-White segregation could affect Black infant mortality rates indirectly as a result of the concentration of high poverty rates within hypersegregated metropolitan areas. Among the 38 SMSAs, in the western areas Black infant mortality increased slightly through 1984 to 1991, while in the southern least segregated areas it declined slightly. Polednak speculates that California's health policy with increasing emphasis on privatization and client case management could contribute to the increase of the infant mortality rate, while decline in the south could be due to Black community empowerment programs developed prior to the 1991 Healthy Start Initiative. Persistently high Black rates hypersegregated metropolitan areas and in regions where theses areas are located may be related to the concentration of extreme poverty, poorer neighborhood quality, and

higher prevalence of specific risk factors for adverse pregnancy outcomes (e.g., maternal medical-nutritional factors, education, reproductive patterns, smoking, and drug use).

At the aggregate level, higher rates of unemployment coincide with higher rates of morbidity and mortality. Some studies indicate the impact of racism in form of wage discrimination on general health outcomes. A study using 1992 NLSY sample shows that Black respondents lived in areas where, on average, the local unemployment rate was 3 times as high as the White rate and almost three times as high as the Hispanic rate. Blacks also experienced the highest mean duration of unemployment (Darity & William, 1993).

Questions arise about how does income inequality relate to poor health? Do economic inequalities deprive people of the necessities of life such and thereby affect their health status? Is social stress associated with deprivation a major influence? Inequality and racism can indirectly contribute to disproportionate burden of disease for Blacks by associating life stressors. These stressors include financial, work, family, safety, police and other municipal services and disrespect or unfair treatment (Schultz, Parker, Israel & Fisher, 2001). Thoits (1995) in an extensive review of literatures on stress draws our attention to a number of studies that shows when compared at similar levels or intensities of stress experience, lower socioeconomic status exhibit higher psychological distress or depression than their higher-status counterparts. However, the social origins of stress are an under researched area. Structural powerlessness, alienation, and lack of control are consequences of stratification system, which may have effects on physical outcomes. Thoits insists that studies are needed to examine the relationship

between macro level structures and micro experiences of stress, and structurally-induced chronic strains and collective coping strategies.

The pathways through which income inequality affects mortality is a complex one. Kaplan and Elsie (1999) analyzed the counties of United States from 1980-1991 and found that income inequality was significantly associated with age specific mortalities and rates of low birth weight, homicide, violent crime, work disability, expenditures on medical care and police protection, smoking and sedentary activity. Not only the effects of inequality are observable in mortality statistics, these are manifested in a wide range of social pathologies. They found that rates of unemployment, imprisonment, recipients of income assistance and food stamps, lack of medical insurance, and educational outcomes were also worse as income inequality increased.

There are two major explanations of how inequality translates into poor health. These are (1) psychosocial explanation, and (2) 'neo-material' perspective. According to the psychosocial explanation, poverty deprives people from nutritious food, adequate shelter, safe work environment, friendly neighborhood, and this has an intergenerational continuity. The result is elevated stress, depression, hostility, hopelessness, and lack of self-control (Wilkinson, 1996). The concept of 'social capital' has been used by some researchers to demonstrate the psychosocial mechanism. Indicators of social capital, such as trust and belonging or social networks are strongly related to mortality rates (Neil & Davey, 2003). This hypothesis has been supported by a number of research (Kawachi et al., 1997). Kawachi et al. measured the level of social trust, membership in voluntary

groups and concluded that disinvestments in social capital appears to be one of the pathways through which income inequality influences mortality rates.

The psychosocial explanation has been rejected by the proponents of the 'neo-material' perspective. They complain that it is hard to understand how emphasis on trust, respect, and support and informal social relations would serve as the basis of public policy agenda to reduce health disparities (Lynch et al., 2000). According to 'neo-material' perspective, health inequalities origin from the differential distribution of resources and capital. As a result, some individuals may be exposed to adverse material and economic condition during critical periods of life like infancy, as well as across the life course (Turrell, 2001). The neo-material approach focuses on a number of area characteristics (physical, social and cultural environment) that are likely to promote or damage health by their presence or absences. These include quality of air and water, housing, recreation, education, transport, policing, welfare service, political and economic history, perceptions of area's reputation by residents, outsiders and planners, and so on.

Theory of Healthy Lifestyle

To explain the findings of a number of researches that certain maternal health behaviors are associated with poor birth outcomes of some ethnic groups, medical sociologists are pointing towards a new major development in sociological theory, the lifestyle as a key concept to explain human behavior (Cockerham, 2000). The theory of healthy lifestyle points to the limitations of Health Belief Model where individuals behavior have been often blamed for higher morbidity and mortality of some racial and

ethnic groups. Becker (1974), Rosenstock (1974) and others developed the HBM with the claim that certain health beliefs have causal effects on health behavior. HBM often attributes the cause of low-birth weight to maternal poor health behavior such as cigarette smoking, drug use, and alcohol consumption, poor diet. Preterm birth is considered the most important cause of low birth weight and largely accounts for poor infant mortality in the United States. The influence of prenatal care, the height and stature of the mother, and her smoking behavior appears to operate via low birth weight (Gortmaker, 1979).

While blaming the individuals, the Health Belief Model highlights the importance of considering ethnicity as a significant predictor of maternal prenatal health behaviors and birth outcomes. Some studies indicate that foreign-born women are less likely to smoke cigarettes, drink alcohol, or use marijuana, cocaine, or opiates during pregnancy (Cabral, 1990). Compared with non-Hispanic mothers, Hispanic mothers were much less likely to have smoked before or during pregnancy (Ventura, 1985). In spite of low socioeconomic status, Mexican-American population has an infant mortality that is similar to whites (Dowling, 1987). But with the exception of cigarette smoking, very little is known about how the lifestyle factors related to ethnicity could cause poor birth outcomes (Shino & Ruth, 1987; 1986).

The theory of healthy lifestyle allows us to include the effects of macro level conditions like, poverty, racism, segregation, stress, and environmental pollution over which individuals have no control, but which must be to coped with. These conditions not only endanger unhealthy living situation, but also contribute to negative lifestyles (Cockerham, 2000). This theory thus explains why drinking and smoking, which is

highly related to very-low birth weight, are prevalent among pregnant women of certain ethnic groups. For explaining negative maternal health behavior of some ethnic groups, Bourdieu would argue that these negative health behaviors are the internalization of external structures in the habitus, including not just past experiences and socialization, but also the realization by the individual of or her disadvantaged circumstances (Bourdieu, 1977).

The emphasis on individually based risk factors have been questioned by sociologists on the ground that these risk factors are nothing but relatively proximal causes (Link & Phelan, 1995; Nazroo, 2003). Between 1842 and 1844, Engles studied working-class people in Manchester and argued that the roots of illness and early death of working class people are lying in the organization of economic production and in the social environment. Engles hypothesized that infant mortality in working-class districts were explainable partly by lack of medical care and partly by the promotion of inappropriate medications. He showed that there is a cumulative effect of class and urbanism and lack of medical care on childhood mortality. Alcoholism of lower class, he claims, was a response to the miseries of working-class life (Waitzkin, 1983). Virchow in his theory of epidemics argued that defects of society were necessary condition for emergence of epidemics. To explain the social origins of illness, he attacked structures of oppression within medicine.

Link and Phelan (1995) provide two reasons for their argument: First, individualized risk factors must be contextualized, by examining what puts people at risk of risks, if we are to craft effective interventions. Second, social factors such as

socioeconomic status and social support are likely "fundamental causes" of disease. By "contextualizing" risk factors they attempt to understand how people come to be exposed to individually based risk factors such as poor diet, cholesterol, lack of exercise, or high blood pressure. A fundamental cause involves access to resources; resources that help individuals avoid diseases and their negative consequences through a variety of mechanisms. They argue that the focus on proximate risk factors, potentially controllable at the individual level, resonates with the value and belief systems of Western culture, which focuses on the individual to control his or her personal fate.

When ethnicity is considered this emphasis on proximal causes underestimates the considerable heterogeneity in experience across ethnic/racial groups, and thereby fails to address the fact that social and economic inequalities, underpinned by racism are the fundamental causes of ethnic inequalities in health (Nazroo, 2003). Nazroo proposes that the centrality of racism should be considered to any attempt to explain ethnic inequalities in health. The socioeconomic disadvantage of the Black people in the United States is the outcome of a long history of institutional racism and discrimination that has produced the current levels of disadvantage.

The vast majority of literature on health concludes that the association between SES and health is causal. Bird, Chole, Conrad & Fremont (2000) propose two possible explanations: (1) the "fundamental social causation" explanation and (2) the "hierarchy stress explanation." According to hierarchy stress explanation, people with relatively low socioeconomic status might suffer from morbidity and mortality at a higher rate either because they are less well situated in terms of material conditions or because their lower

position in a social hierarchy is inherently stressful. Wilkerson's (1997) relative deprivation theory supports this explanation. The fundamental causation approach argues that there is something fundamental about the association between SES and mortality that causes an association to emerge under dramatically different conditions. It suggests that societies 'create and 'shape' patterns of disease.

Associations between fundamental social causes and risk factors continually re-emerge, and the relationship persists. Clifford et al. (1978) points the need for focusing on the relationship of socioeconomic determinants and infant mortality over time. He notes that the nature of the relationship between various indicators of socioeconomic status and infant mortality changes and that observations at a single point in time are inadequate to assess trends in the differences. Robert and House (2000) propose to measure socioeconomic position and health at different points of life course to better understand the relationship.

Health life styles are defined as collective patterns of health-related behavior based on choices from options available to people according to their life chances. Cockerham states that aside from Max Weber, interest in lifestyle theory has only recently begun to emerge. Weber's life chances are not just a matter of pure chance; rather they are the chances people have in life because of their social location. Cockerham points out that in Weber's point of view people are constrained in determining their lifestyles but have the freedom within the constraints that apply to their situation in life. On the other hand, Giddens notes that structure places limits on the range of options open to an actor, but it is possible to for the structured properties of social

systems to stretch out, in time and space, to the point at which they are beyond the control of any individual actors (Cockerham, 2000).

Cockerham focuses that when disadvantaged life chances reduce the opportunities for positive health behaviors or reduce their effectiveness, the impact of agency is minimized despite educational campaigns to improve health by changing behavior.

New Health Care Technologies

Gortmaker and Wise (1997) speculate that new health care technologies may have altered the traditional pathways of social influence. They suggest that major technological advances in the clinical management of high-risk pregnancy and the critically ill newborn have altered the structure of infant mortality in the United States, and thus elevated the importance in access to this care in shaping absolute and disparate infant mortality rates. They point out that in 1990 approximately 63% of infant mortality occurred in the neonatal period compared to 70% in 1950. The recent reduction in neonatal mortality in the United States has been due almost entirely to improvements in birth weight-specific survival. However, prenatal effects, viewed in isolation are not enough to explain the disparate rates f infant mortality, rather these should be viewed in a broader context that includes social and clinical mechanisms that operate over the continuum of a woman's reproductive life. They expressed doubt in whether disparities in infant mortality could be eliminated by universal access to health services to children and women, since though the National Health Service provides accessible care to the whole population disparities still persist in Britain.

Support for Gorthmaker and Wise's argument for technology's contribution could be cited from several studies. The level of neonatal mortality rate varies by level of perinatal care at the birth hospital. Julia et al. (2002) noted the highest death rate for infant born at hospital offering the lowest level of care. Assuming that the differences in mortality were due to care level of the birth hospital, they argued that 16-23% of neonatal deaths among very-low-birthweight infants could have been prevented. This influence of technologies of care on infant mortality leads to some explanation of disparate infant mortality rates among racial and ethnic groups Blacks are more than three times more likely to receive no prenatal care compared with whites (Vintzileos et al., 2002).

Infant mortality appears to vary between rural and urban areas. In a cross-sectional study of all American Indians/Alaskan Natives births to US residents, it was found that receipt of an inadequate pattern of prenatal care was significantly higher for rural than for urban mothers of AI/AN infants (18.1% vs. 14.4%). These rates were over twice that for Whites (6.8%). This situation may reflect barriers to optimal care e.g., greater distances from health services, and limited transportation systems in rural areas (Baldwin, Grossman, Casey, Hollow, Sugarman, Freeman & Hart, 2002). Place of residence has been documented as an important risk factor for black neonatal mortality.

The degree of access to prenatal care can affect the pregnancy outcome greatly. A study conducted in Wisconsin, found that all African-American mothers were nearly eight times as likely as all white mothers to have inadequate prenatal care. Moreover, poor African-American mothers were three times as likely to have inadequate prenatal care as were poor white mothers (Sims & Rainge, 2002). Goodman et al (2002) found

that a greater supply of neonatologists or neonatal intensive care beds is associated with lower neonatal mortality. They concluded that the regions with higher IMR might have inadequate neonatal intensive care resources.

Disparities due to Factors other than related to Access

A growing body of literature document that patients' race and ethnicity significantly predict the quality and intensity of care they receive. Even at equitable levels of access to care, racial and ethnic minorities experience a lower quality of health services and are less likely to receive even routine medical procedures than white Americans. The Institute of Medicine (IOM, 2003) summarized over 100 studies published within the last 10 years, which according to them represent only a fraction of published studies that assessed racial and ethnic variation in the range of clinical procedures, including the use of diagnostic and therapeutic technologies.

The racial discrimination experienced by African Americans are so unique compared to the histories and biographies of diverse ethnic and racial populations in the United States that Doris Wilkinson (1980 & 2000) questioned the use of the concept 'minority' for the African Americans. She argues that unlike other ethnic and racial groups, African-Americans have encountered a myriad of barriers since their forced arrival, and therefore, the use of the concept 'minority' as synonymous to race is actually nonscientific and devoid of conceptual clarity and empirical validity. Healthcare system is not an isolated sector in society, rather patients, staff, and providers mirror social attitudes and trends, and are affected by the residues of United States' history of racial discrimination.

When controlled for age, insurance status, income, co-morbid conditions and symptoms, African-Americans and Hispanics are less likely to receive appropriate cardiac medication or to undergo coronary bypass surgery. After controlling for clinical-risk factors, delivery via cesarean is more likely for non-white women (Aron, Gordon, DiGiuseppe et al., 2000); and for non-speaking women who deliver at for profit hospitals (Braveman, Egerter, Edmonston, and Verdon, 1995). Black women are less likely to receive ultrasonography than white women although the risk of idiopathic pre-term delivery is three times higher in black women (Brett, Schoendorf, and Kiely, 1994). After adjustment for covariates, more white women reported receiving advice for alcohol and smoking cessation (Kogan, Kotelchuck, Alexander, and Johnson, 1994); and prenatal care utilization is lower for black patients than white patients (Barfield, Wise, Rust et al., 1996).

The Institute of Medicine (IOM) examined a range of these above "beyond access-related factors" that may be involved in racial and ethnic healthcare disparities, The Committee recognized that the access level factors or the "threshold" factors (i.e., income, health insurance status, geography) are likely the most significant barriers to equitable care, however, when these are held constant, bias, discrimination, and stereotyping at the individual, institutional, and health systems levels may explain some part of the disparities.

Variable level	Variables
Patient-level	The role of preferences, treatment refusal, and the delay in seeking care
Healthcare systems-level	Language barrier, time pressure on physicians, geographic availability of healthcare institutions, financing and delivery of healthcare services
Care process-level	Bias or prejudice against minorities, clinical uncertainty when interacting with minority patients, characteristics of clinical encounter

Source: Institute of Medicine (IOM), 2003.

IOM cited a number of literature that suggest minority patients are more likely to refuse recommended services (e.g., Sedlis, et al., 1997), adhere poorly to treatment regiments, and delay seeking care (e.g., Mitchell & McCormack, 1997), which can be the result of cultural gap of the patient and physician, mistrust, misunderstanding of provider instructions, or a lack of understanding of knowledge of how to best use healthcare services. IOM argues that these patient-level variables are unlikely to be major sources of healthcare disparities because research indicates that the differences in refusal rates of recommended treatment between whites and minority patients are small.

On the other hand, IOM observed that the ways in which healthcare systems are organized and financed may exert different effects for racial and ethnic minorities.

Language barriers not only poses a problem for non-English speaking patients, but also hampers physician's' ability to accurately assess presenting symptoms specially under time pressure. A study on availability of services indicates that only one in four pharmacies located in non-white neighborhoods carried adequate supplies compared to 72 percent of pharmacies in the predominantly white neighborhoods (Morrison, Wallesnstein, & Natale, 2000).

IOM identifies three mechanisms of healthcare disparities from the provider's side of the exchange: bias (or prejudice) against minorities, greater clinical uncertainty when interacting with minority patients, and beliefs (or stereotypes). Van Ryn and Burke (2000) examined the degree to which patient race and socio-economic status (SES) affect physicians' perceptions of patients during a post-angiogram encounter. Even after controlling for patient age, race, and sickness symptoms, physicians tended to perceive African-Americans and members of lower SES groups negatively and as less intelligent, more likely to engage in high-risk behavior, and less likely to adhere to medical advice. Physicians are less likely to offer explanations to patients with lower SES because they are perceived as less interested in information (Pendelton & Bochner, 1980).

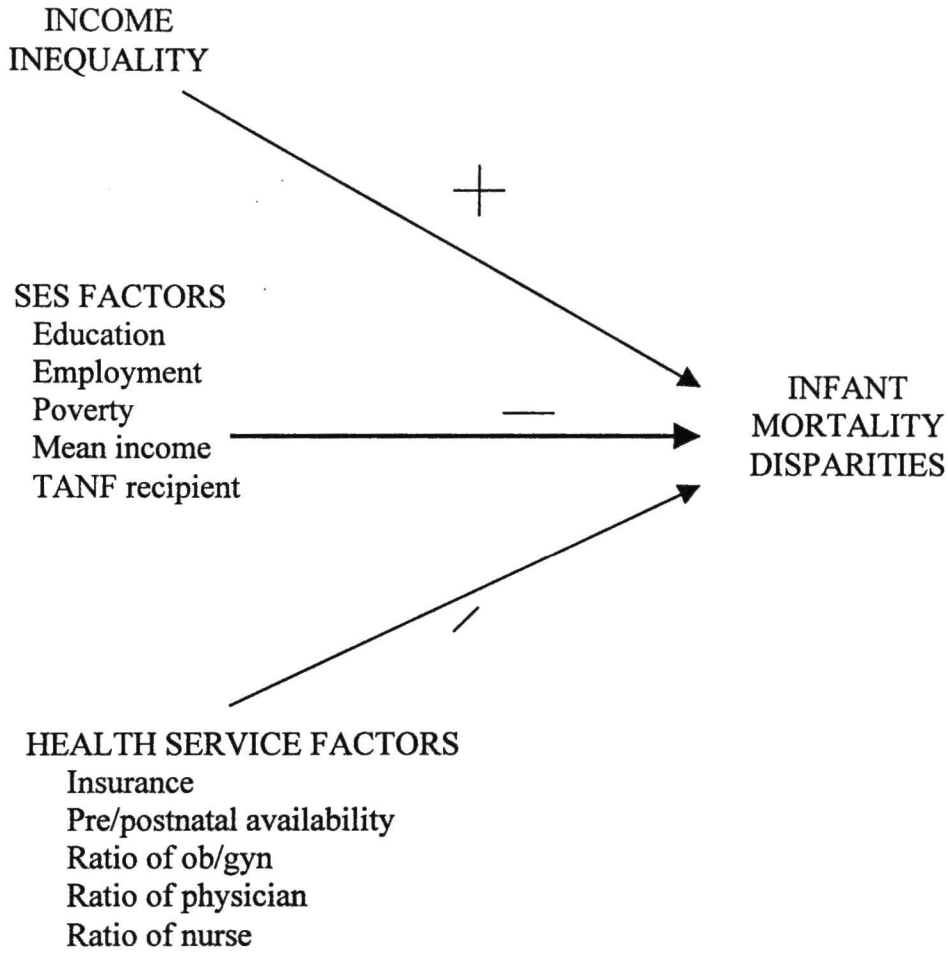
Research Model and Hypotheses

Three theories discussed in the previous section provide conceptual framework for this study. Drawing from Wilkinson's theory this study will focus on income inequality as a predictor of the racial gap in infant mortality rates. Counties where income inequality is higher than the average state level, infant mortality for the African-Americans would be higher than the Whites. Cockerham's healthy life style theory

focuses on how macro level conditions such as poverty, environmental pollution, and education are transformed into micro level conditions of health behavior of groups of individuals. The theory of healthy lifestyle stresses on the importance of examining the association of SES factors with health. Studies on the role of technology strongly suggest that availability of prenatal care, care level of the birth hospital, urbanization are crucial predictors of very-low-birth weight.

In this study, infant mortality disparities between Whites and Blacks is the dependent and income inequality is the independent variable while a number of SES and health service variables will be controlled for their confounding effects (Figures 2).

Figure 2. Causal Model for Predicting Infant Mortality



Hypothesis

The following hypothesis was tested in this study.

H_1: Income inequality among the population is a significant predictor of infant mortality disparities. This relationship between income inequality and infant mortality rates will hold when controlled for SES and health service factors.

CHAPTER II

DATA AND METHOD

Data Sources

Data for this study were obtained from the U.S. Census Bureau and the Texas Department of Health. In the 2000 census the majority of the households participated through a mailout/mailback operation. Eighty-three percent households (83%) received a short-form, while 17% was selected to receive the long-form questionnaire. Sixty five percent of households responded to the mailout/mailback census. Throughout the decade between censuses the Bureau continually conduct surveys to produce data. Two surveys are most important sources: demographic survey, and the economic survey. The Texas Department of Health (TDH) maintains a wide variety of databases including disease registries, vital statistics, morbidity information, risk factors surveys, demographic forecasting, licensing and certification data for health professionals and health facilities. Most of the TDH data are available online through the TDH website.

The units of analysis for this study were the counties of Texas. Data will be obtained on all of the 254 counties of Texas. The advantages of using counties as unit of analysis are manifold. One of the major advantages is that county boundaries change very little over time and thus represent comparatively stable representative units (Clifford et al., 1978). Another advantage is that focusing on a specific county or state's infant

mortality is an important step in selecting local strategies to improve infant mortality rate (Gould, 1989). However, the problem with counties is that aggregate level data may not apply to the behavior of individuals (Clifford, 1978).

Dependent and Independent Variables

Infant mortality disparity is the dependent variable for this study. This was be calculated by deducting the infant mortality rates for whites from the rates for blacks. Infant mortality will be defined in this study as deaths between ages 0 to 12 months by all causes of death. Since infant mortality rate is calculated per 1000 live births, at county level these rates fluctuate greatly from year to year especially for the small counties. To overcome this problem, this study used averaged rates for the years 1999-2001. These average rates for counties were extracted from the Texas Department of Health data which is available online.

Income inequality is the major independent variable. There are many different ways of calculating income inequality: the ratio of income share, the Robin Hood Index, the Atkinson Deprivation Index, and the Gini Coefficient. In this study Gini coefficient will be used as a measure of income inequality. The Gini coefficient is based on the Lorenz curve, where the distribution of a specific variable is compared to the uniform distribution that represents equality. The Gini ranges from 0 to 1.0, or absolute equality to absolute inequality.

A number of socioeconomic and health services variables were used in this study to control for the effects of income inequality on the dependent variable- infant mortality rates. The socioeconomic variables include education, unemployment rate, urbanization,

percentage of population living under poverty, and average TANF recipients. Education has been measured as percentage of population with education less than grade 9. Unemployment rate has been measured by percentage of unemployed population in the middle of 1998. Data on urbanization were dummy coded as 1=urban and 0=rural county. Poverty will be measured by percentage of population living below the poverty line in each of the 254 counties.

Health service variables that were used in this study are insurance status, availability of pre and postnatal services, ratio of population per direct care physicians, ratio of population per obstetrician, and ratio of population per registered nurse. Availability of prenatal and postnatal services is a dichotomous variable. It is originally a nominal variable in the TDH data with 'yes' or 'no' responses. For analysis, this was dummy coded as 0= no pre and postnatal services available, and 1= pre and postnatal services available. Insurance status was be measured by percentage of population without insurance in each county.

Table 1. List of Variables

Variables	Description	Source
Infant Mortality Rate	Deaths between ages 0 to 12 months by all causes of death per 1000 live births	Texas Department of Health (TDH)
Income inequality	Gini coefficient based on family income in 2000	Constructed with Census Bureau data
Employment	Percent of employed population age and older	U.S. Census, 2000
Income	Median Household Income in 1999	U.S. Census
Poverty	Percentage of population living below poverty	U.S. Census, 1999
Average TANF recipients	Percent of population receiving TANF in 2000	U.S. Census
Education	Percent of Persons 25 Years of Age or Older who are High School Graduates in 2000	U.S. Census
Urbanization	Metropolitan status	TDH
Insurance	Percent of population without insurance in 2000	U.S. Census
Pre and post-natal services	Whether pre and post natal services are available at the county hospital	TDH, 2000
Physician	Ratio of population per direct care physician	TDH, 2000
Obstetrician	Ratio of population per obstetrician in 2000	TDH
Registered nurse	Ratio of population per registered nurse in 2000	TDH

Reliability and Validity

Data for this study were obtained mostly from the Census Bureau, which is the largest statistical agency of the Federal Government. The Census Bureau is committed to maintain validity of its data. The Census Bureau provides information that is accurate, reliable and unbiased and it achieves this objectivity by using reliable data sources and sound analytical techniques and by using highly qualified people to prepare data products. From collection to dissemination of information it conforms to the information quality guidelines set by the statistical agencies in the Federal government.

The only variable that was constructed out of Census data on household income is the income inequality index. There is no universally accepted method for this. Among the various techniques, Gini coefficient has been widely used to measure income inequality (Lochner et al., 2001; LeClere and Soobeder, 2000; Kawachi and Kennedy, 1997). Therefore this study will use Gini coefficient for constructing the inequality index.

Statistical Analysis

Data were processed through SPSS. Multiple linear regressions was conducted to test the hypotheses. Two separate models were tested. In the nested model, infant mortality disparity was regressed on income inequality. In the full model, all the socioeconomic and health care service variables were added to determine if the original relationship of income inequality and infant mortality disparity indicated by model1 still holds.

CHAPTER III

RESULTS AND DISCUSSION

In this chapter I will examine the effect of income inequality on the dependent variable disparity in infant mortality rates between African-Americans and Whites (Black infant mortality rate-White infant mortality rate). In the first model, I have regressed income inequality measured by Gini coefficients on the dependent variable. In the second model, I controlled for SES factors and health service variables to determine if the effect of income inequality still holds. Before running the regressions, I examined the sample characteristics and bivariate relationships among the variables.

Sample Characteristics

The sample of this study includes only those counties that had 5 or more infant deaths for both African Americans and also for Whites during 1999 to 2001. These counties are: Bell, Bexar, Bowie, Brazoria, Brazos, Collin, Dallas, Denton, Ector, Ellis, El Paso, Fort Bend, Galveston, Garyson, Gregg, Harris, Harrison, Jefferson, Liberty, Lubbock, Mclennan, Midland, Montgomery, Nueces, Orange, Panola, Potter, Smith, Tarrant, Taylor, Tom Green, Travis, Walker, Wichita, and Williamson. Among them, Tom Green was found to be an outlier in the analysis (sdr> $|2.5|$). Tom Green exhibits extreme value on the dependent variable- disparities in infant mortality rates. For example, the difference of Black and White infant mortality rate in Tom Green is 25.70,

whereas for Texas the average difference is 8.675. To avoid the undue influences of this case on the overall results, this county was excluded from analysis. Therefore, 34 counties were included in the final analysis. Descriptive statistics for the variables are presented in Table 2.

The average infant mortality from 1999-2001 for Texas was 5.9 per 1000 live birth, and the disparity among Blacks and Whites was 7 per thousand population. For Blacks the average infant mortality rate was 12.0 and for Whites the rate was 5.0. In the sample of 34 counties the disparity in infant mortality rates among Blacks and Whites was 8.67 (sd= 4.25) per thousand person. On average 66.32 percent of these counties population is White, and 12.84 percent are Black. Proportion of White population in the counties included in the sample ranges from 22.2 to 87.7 percent, while proportion of Black population ranges from 3.3 to 32.6 percent.

Table 2. Descriptive Statistics of Variables Used in the Analysis, Texas Counties, 1999-2001

Variables	Mean	S.D.
Dependent Variable		
Disparities in Infant Mortality Rates	8.675	4.254
Independent Variables		
Income Inequality	.417	.027
SES Factors		
% of population with education less than Grade 9	10.796	3.631
Unemployment rate	5.035	2.604
% of population living below poverty line	15.150	4.780
Mean income	52975.56	12103.01
Average TANF recipient	8857.147	203.12
Health Service Factors		
% of population uninsured	22.824	2.619
Pre/postnatal services available	.88	.33
Ratio of ob/gyn	3206.62	3555.12
Ratio of direct care physician	911.59	.941
Ratio of registered nurse	203.12	114.83

N = 34

In 2001, the Gini coefficient measuring average income inequality in the sample counties was 0.417, which is slightly lower than the United States (0.434). Ninety-four percent of these counties are urban counties. Since we selected only those counties with 5

or more infant deaths during 1999-2001, urban counties have been over-represented where higher concentration of Blacks is typical.

On average, the counties have 10.80% adults with less than Grade 9 education. Five percent of the population in these counties was unemployed in 1999. On average, 15% of population lives below poverty line. Mean family income in 2001 was 52,975.56, and average number of TANF recipients was 8857.147.

Compared to the national statistics, number of uninsured is higher in the 34 counties analyzed in this study. Twenty-three percent of the population does not have any insurance, and pre natal and postnatal services through Texas Department of Health are available to 88% of the counties. On average these counties have 1 ob/gyn per 3,207 people; 1 direct care physician per 912 people; and 1 registered nurse per 203 person.

A bivariate correlation was conducted to examine how the variables are correlated and whether there is a problem of multicollinearity in the analysis. The results of the bivariate correlation are presented in Table 3.

Table 3. Correlation Matrix for Variables Used in the Analysis, Texas Counties, 1999-2001.

	1	2	3	4	5	6	7	8	9	10	11	12
1. IMR Gap	1.000											
2. Inequality	-.042	1.000										
3. Education	.367*	-.003	1.000									
4. Unemployment	.272	.115	.271	1.000								
5. Poverty	.146	.557**	.432**	.475**	1.000							
6. Mean income	-.356*	-.293	-.427*	-.496**	-.857**	1.000						
7. TANF recp.	-.182	.517**	.060	-.039	.196	.082	1.000					
8. Uninsured	-.095	.547**	.313	.078	.685**	-.362*	.497**	1.000				
9. Pre/postnatal	-.100	.123	.101	-.168	.082	-.054	.179	.378*	1.000			
10. Ob/gyn	-.252	-.334*	-.044	.183	-.038	-.006	-.158	-.091	.162	1.000		
11. Physician	.252	-.560*	.268	.327	-.176	.065	-.247	-.279	-.353*	.416*	1.000	
12. Ratio nurse	-.018	-.559**	.020	-.044	-.475**	.479**	-.234	-.307	-.142	.412*	.740**	1.000

Note: N = 34. *P<.05 **P<.01 (2-tailed)

Table 3 indicates that IMR Gap is positively correlated with education (r=0.367, p<.05), and negatively correlated with mean income (r=-0.369, p<.05). Counties with higher percentage of population with education less than Grade 9 are more likely to have higher IMR Gap. Similarly as the mean income increases the Gap is likely to decrease.

There is a substantial positive association between income inequality and poverty (r=.557, p<.01), average TANF recipients (r=.517, p<.01), and percentage of population without insurance (r=.547, p<.01). Counties with higher income inequality are more likely to have higher percentage of population living below poverty line, greater number of people receiving TANF, and more people without insurance. Income inequality, on the contrary, is negatively correlated with ratio of ob/gyn (r= -.334, p<.05), ratio of direct care physician (r= -.560, p<.05), and ratio of registered nurse (r= -.559, p<.01). Counties with higher income inequality are likely to have fewer number of ob/gyn, direct care physician, and registered nurse per thousand person.

Percentage of population with education less than Grade 9 is positively correlated with percentage of population living below poverty line (r=.432, p<.05), but negatively correlated with mean income (r= -.427, p<.05). Counties with more population with education less than Grade 9 are likely to have higher number of people living below poverty line.

Unemployment rate is moderately and positively correlated with poverty rate (r= .475, p<.01), but negatively correlated with mean income (r= - .496, p<.01). Counties with higher unemployment rate are likely to have higher number of people living below poverty line, and lower mean income.

Poverty rate is very strongly and negatively correlated with mean income (r= -.857, p<.01), and weakly and negatively correlated with ratio of registered nurse in a county (r= -. 475, p<.01). The association between poverty and percentage of uninsured is moderate and positive(r= .685, p<.01). Counties with higher number of population living below poverty line are likely to have lower mean income, fewer number of registered nurse per thousand person, and higher number of uninsured.

Mean income is negatively correlated with percentage of population without insurance (r= -.362, p<.05), but positively correlated with ratio of registered nurse (r= .479, p<.01). Counties with higher mean income are likely to have fewer people without insurance, but more registered nurses per thousand person.

Average number of TANF recipients is moderately correlated with uninsured population (r= .497, p<.01). Counties with higher number of TANF recipients are likely to have higher proportion of uninsured population.

Percentage of Uninsured population of a county is weakly and positively correlated with the availability of prenatal and postnatal services in that county (r= .378, p<.05). Counties with higher percentage of uninsured are more likely not to provide prenatal or postnatal care through the health department. A county's availability of prenatal and postnatal services is weakly and negatively correlated with that county's ratio of direct care physician per thousand person (r= - .353, p<.05). Counties where prenatal and postnatal services are not available through the health department are also more likely to have fewer direct care physicians per thousand person.

Ratio of Ob/gyn is moderately and positively correlated with both ratio of direct care physician ($r = .416$, $p<.05$), and ratio of registered nurse per thousand person ($r = .412$, $p<.05$). Counties where the ratio of ob/gyn per thousand person is higher, it is expected that the ratio of direct care physician and registered nurse per thousand person will also be higher.

Ratio of physicians per thousand person is strongly and positively correlated with ratio of registered nurse ($r=.740$, $p<.01$).

The bivariate analysis in Table 3 shows that except poverty and mean income, none of the independent variables are highly correlated among themselves. Poverty is highly correlated with mean income ($r=0.857$, $p<.01$), which suggests that there may be a problem of multicollinearity between them. Since percentage of population living below poverty line is a measure of income dispersion, and I have used family income inequality in both the models, to avoid the problem of multicollinearity it appears logical to drop poverty from the analysis.

Regression Results

Two models were tested to investigate the predictors of disparities in infant mortality rates between Blacks and Whites. In the preliminary analysis, some independent variables were found to have very low effects (even less than 0.000), and statistically insignificant. These are: average TANF recipients, and ratio of population per registered nurse. Since, the number of total case (counties) is not very large, to better satisfy assumptions of the multivariate analyses, these variables were eliminated from the final analysis. Results of regression are presented in Table 3.

In the first model, household income inequality was regressed on disparities in infant mortality rates between African Americans and Whites, without controlling for any other variables. The regression results indicate that income inequality alone cannot explain this disparity. The effect of income inequality is statistically insignificant, and only 0.6% of the disparity can be explained by income inequality alone.

Table 4. Determinants of Disparities in Infant Mortality Rates, Texas Counties, 1999-2001.

Predictor	Model 1 B (S.E.)	Model 2 B (S.E.)
Constant	13.675 (11.671)	14.340 (12.698)
Income Inequality	- .120 (.279)	.243 (.307)
SES Factors		
Education (less than Grade 9)		-.031 (.193)
Unemployment rate		.147 (.273)
Mean income		-.0002* .000
Health Service Factors		
% of population uninsured		-.606* (.286)
Pre/postnatal services available		4.034 (2.102)
Ratio of ob/gyn		-.0007*** .000
Ratio of direct care physician		.005** (.001)
R^2	.006	.608
F	.184	4.856***
N	34	34

* p<.05 **p<.01 ***p<.001

Note: Unstandardized regression coefficients and standard errors are presented. Standard errors are in parentheses.

Model 2 explains 61% of the variation in disparities in infant mortality rates. In this model, three SES factors and five health service factors have been added with income inequality. When controlled for income inequality, the SES and health services variables, with one point increase of Gini coefficient racial disparities in infant mortality increase by 0.27 per thousand person, but this effect is not statistically significant. Therefore, my hypothesis that income inequality is a predictor of infant mortality differences of African Americans and Whites is not supported. When income inequality alone was regressed on the dependent variable, the effect was also statistically insignificant.

In model 2, among the SES factors, mean income is a significant predictor of racial disparities in infant mortality rates. With each additional dollar of mean household income the disparity of infant mortality is reduced by 0.0002 per thousand person ($p<.05$). Percentage of population with education less than Grade 9, and percentage of unemployed population do not have any statistically significant effect on racial disparities in infant mortality rates.

Compared to the SES factors, a number of health service variables were found to be significant predictors of racial disparities in infant mortality rates. Number of uninsured is a significant predictor of IMR Gap. As percentage of uninsured increases by 1 percent IMR Gap decreases by .606 per thousand person ($p<.05$). Ratio of ob/gyn per 1,000 person is a highly significant predictor ($p<.001$). With each additional ob/gyn in a county the disparity is expected to lowered by 0.0007 per thousand person. However contrary to my expectation, the ratio of direct care physician was found to have a

negative effect on the racial disparities in infant mortality. With each additional direct care physician in a county the difference is increased by 0.005 per thousand person ($p<.01$).

Though income inequality was not found to be a statistically significant predictor of infant mortality rates of the counties, a number of studies suggest that inequality varies depending on location and extent of urbanization. Out of 36.6 million poor people in the United States, some 27 million live in city and suburban areas. Of these 27 million, more than half lived in central cities (Ginsburg, 1999). Therefore, I have added a specification variable as a control in the analysis: metropolitan status of the county. The 34 counties are classified in three categories based on their metropolitan status: metro-adjacent, metro-suburban, and metro central city. Two counties are metro adjacent, 11 are metro-suburban, and 21 are metro-central cities. Descriptive statistics of the metro-suburban and metro-central city counties are provided in table 5.

Table 5. Descriptive statistics of the sample counties based on metropolitan status.

	Metro-suburban Mean (Std. Deviation)	Metro-central city Mean (Std. Deviation)
IMR Gap	8.92 (4.36)	8.13 (2.92)
Income inequality	.39 (2.60)	0.43 (1.83)
% below poverty line	11.61 (5.11)	16.72 (3.74)
Mean income	61395.82 (16000.59)	49715.714 (6984.71)
Ratio of direct care physician	1366.18 (387.03)	544.62 (141.78)
Ratio of ob/gyn	5366.45 (4825.04)	1811.90 (523.74)

N = 32

Table 5 shows that in metro-central cities, income inequality is higher than in metro-suburban cities, but the gap of infant mortality between whites and African-Americans is lower. Compared to the metro-suburban counties, very rich and very poor people live in metro-central cities. However, metro-central cities have better safety net for health care for the poor than the metro-suburban cities, which may explain why IMR

gap is lower in metro-central cities. To explain this finding, I conducted a bivaraite correlation among IMR Gap, percentage of uninsured population, and income inequality (Table 6 & 7).

Table 6.Correlation Matrix for IMR Gap, uninsured population, and income inequality in metro-suburban counties, 1999-2001.

	IMR Gap	Uninsured	Inequality
IMR Gap	1.000		
Uninsured	0.519	1.000	
Income inequality	0.568*	0.295	1.000

Note: N = 32. *P<.05 **P<.01 (1-tailed)

Table 7.Correlation Matrix for IMR Gap, uninsured population, and income inequality in metro-central city counties, 1999-2001.

	IMR Gap	Uninsured	Inequality
IMR Gap	1.000		
Uninsured	0.231	1.000	
Income inequality	-.383*	0.534**	1.000

Note: N = 32. *P<.05 **P<.01 (1-tailed)

Table 6 and 7 indicate that both in metro-suburban and metro-central counties, income inequality is significantly correlated with infant mortality gap. However, in metro-suburban counties, infant mortality gap increases as income inequality increases,

whereas in metro-central cities, IMR gap decreases as income inequality increases. For metro-central counties, insurance status is statistically significantly correlated with income inequality. As income inequality increases percentage of uninsured increases in metro-central counties.

Discussion

The primary goal of this study is to examine the determinants of inequality in infant mortality between Whites and African-Americans. Building on the view that in the developed countries the higher mortality rates are a result of relative poverty, rather than a result of absolute poverty, this study set out to examine income inequality, SES factors and health service factors as predictors of higher infant mortality for the African-Americans than the Whites. In this section, I will discuss my findings, the limitations of my work, and suggestions for future research.

I found that income inequality of a county does not have any statistically significant effect on the difference of infant mortality rates of African-Americans and Whites. There are several potential explanations for this result. First, I examined the direct effect of income inequality on infant mortality, but the effect could be in fact indirect in nature. Income inequality may translate into poor health outcomes through a causal pathway. Income inequality may increase behavioral risks through inducing psychological stress and unhealthy lifestyles (Wilkinson, 1996). In the bivariate analysis of the variables. I found that the bivariate analysis does indicate statistically significant association among income inequality and a number of variables. Income inequality has substantial positive association with percentage of population living below poverty line,

average number of TANF recipients, percentage of population without insurance. On the other hand, income inequality is substantially and negatively correlated with ratio of ob/gyn, direct care physician, and registered nurse per thousand person. A county with higher income inequality is more likely to have higher rates of poverty, uninsured population, and fewer health care providers, such as ob/gyn, direct care physicians, and registered nurse, which have shown to have statistically significant effects on my dependent variable difference of infant mortality between African-Americans and Whites in this study.

When a specification variable 'metropolitan status' was introduced in the analysis, I found that income inequality is positively correlated with IMR gap in metro-suburban counties, while negatively correlated with IMR in metro-central cities. Better health care safety net in the metro-central cities for the uninsured may explain this finding. Among the 21 metro-central counties, 12 metro-central cities run hospital districts and/or public hospital programs. Therefore increase of income inequality does not necessarily result in increase of IMR gap in metro-central counties probably because the residents have better health care safety net. On the other hand, the metro-suburban counties are more likely to operate indigent health care programs for the indigent residents. Among the 11 metro-suburban counties in the sample, only 3 provide health care to the indigent through hospital district and/or public health hospitals. The indigent health care programs (CIHCP) are generally the weakest of the three alternatives for indigent care, while the Hospital District and Public Hospital plans are stronger because

they fund providers (hospitals) and are more likely to have sliding scale fees for people with low incomes, as well as a legislated mission to serve the poor.

Secondly, this study examined income inequality as a static term, and measured it at one point of observation. According to theory of life course perspective, individuals have histories of health as well as histories of income, and the link between them can be better understood by examining the dynamic relationship among them (McDonough & Berglund, 2003). Life course theory views nature and origins of poverty as a complex and dynamic process. It is argued that the causes and consequences of long periods of poverty differ so fundamentally from those of short ones that the two experiences should be categorized as separate phenomena.

The two major explanations provided by the income inequality perspective on how inequality affects health are (1) psychosocial explanation, and (2) 'neo-material' perspective. Both these explanations indicate that the effect of income inequality has an intergenerational continuity. According to the psychological explanation, poverty elevates stress and unhealthy behavior by depriving people from nutritious food, adequate shelter, safe work environment, friendly neighborhood, and this has an intergenerational continuity. The 'neo-material' explanation admits that some individuals may be exposed to adverse material and economic condition throughout the life course, and especially during critical periods of life like infancy. African-Americans disproportionately have always suffered from racial discrimination and poverty. The income inequality perspective applied from the viewpoint of life course research may provide us with a fuller understanding of the determinants of higher infant mortality for this racial group.

Finally, my data is obviously constrained by a small sample size and over-representated by urban counties. I selected only those counties that had a total of 5 or more infant deaths during 1999-2001, which resulted in 94% counties characterized as urban in my sample. With a larger sample the effects of income inequality could be different.

The effect of mean income in this study was expected. When controlled for income inequality and health service factors, counties with higher mean income are likely to have less difference in infant mortality between African-Americans and Whites.

The health service factors I examined were found to be important influences on infant mortality differences between African-Americans and Whites. For example, ratio of ob/gyn per thousand person was found to be a significant predictor of IMR Gap. As number of ob/gyn per thousand person increases in a county, the IMR difference is predicted to decrease. On the contrary, ratio of direct care physicians per thousand person indicates unexpected result: with each additional direct care physician the difference in IMR between African-Americans and Whites increases.

Insurance status also exhibited unexpected effect on IMR Gap in this study. With increase in uninsured persons the IMR Gap decreases, which does not appear to be logical according to the theoretical framework of this study. One possible explanation might be that even if a person is insured, she may not be able to find a doctor or hospital to treat her if there are shortages of physicians and hospitals in the county. In order to understand the effect of insurance status on IMR gap between Whites and African-

Americans more fully, further research is needed focusing on insurance status of African-Americans and Whites separately.

The unexpected results on ratio of direct care physician and insurance status might partially be explained by the rich literature that document that even at equal level of access to care, African-Americans are likely to receive lower quality of care (Aron, Gordon, DiGiuseppe et al, 2000; Braveman, Egerter, Edmonston, and Verdon, 1995; IOM, 2003). The prenatal care African-American women receive is significantly different in regard to quality than the whites. They receive less advice and even routine medical procedures than white Americans (Braveman, Egerter, Edmonston, and Verdon, 1995; Brett, Schoendorf, and Kiely, 1994; Kogan, Kotelchuck, Alexander, and Johnson, 1994).

Limitations and Future Research

I have noted the following limitations of my study that need to be considered. Among them the principle one, as mentioned previously, is the size of the sample. I had to include only 34 counties in my final analysis. The rest of the counties were excluded since they had less than 5 infant deaths for African-Americans as well as for Whites during 1999-2001. This might have restricted the representativeness of my sample and confined it mainly to selection of urban counties. The degrees of freedom in this analysis was below 30 (34-8=26) which might have increased the standard error and resulted in some insignificant coefficients.

Another limitation of this study relates to the problem of measuring family income. Measuring income inequality involves some conceptual problems. Russett et al (1981) points out that even much more complex and accurate income data can be

misleading because of differences in prices between rural and urban environments, different needs of workers in different situations, and the omission of non-monetary income. However, in the absence of any such income measures, this present study had to rely on the available data from the Census Bureau.

Further, I have not examined some proximate factors, such as low-birth weight, teen pregnancy, and percentage of unwed mothers. All these three factors might be highly correlated with infant mortality rates. All these three could be also correlated with income inequality, and therefore need to be addressed by future research in this area.

Finally, this study focused only on African-Americans and Whites, excluding Hispanics from the analysis. Adding Hispanic population in the analysis may add to our understanding of the determinants of infant mortality.

CHAPTER IV

SUMMARY AND CONCLUSION

This study provides an initial examination of predictors of differences of infant mortality between African-Americans and Whites. Findings suggest that income inequality of a county is not a direct predictor of higher infant mortality of African-Americans than Whites. However, the association of inequality and IMR gap varies based on the metropolitan status of the county. Metro-central cities are characterized by higher income inequality, but due to stronger health care safety net, the gap of IMR between whites and African-Americans may be lower. On the other hand, instead of lower inequality in the metro-suburban counties, IMR gap is higher may be because of weaker safety net for the residents. Though insurance status consistently has been documented as a strong positive determinant of health status, this study found a negative effect of insurance status of IMR gap. This implies the importance of including variables other than related to access (such as, quality of care) in understanding of health status disparities between whites and African-Americans. Income inequality perspective alone may not capture the mechanisms linking inequality and health outcome, though existing research indicate that consequences of inequality may have effects on physical outcomes via structural powerlessness, alienation, and lack of control. Infant mortality for African-Americans has always been higher than Whites in the United States. Further research

incorporating the dynamic consequences of inequality as conceptualized by life course perspective is needed to fully understand how the cumulative disadvantages of income inequality might have translated into higher infant mortality rates for African-Americans than Whites.

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