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Walden University

College of Health Sciences

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Marian Taylor

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Walden University
2017

Abstract

Infant Mortality among African American Women Compared to European American Women in New York City

by

Marian Taylor

Dissertation Submitted in Partial Fulfillment

of the Requirement for the Degree of

Doctor of Philosophy

Public Health

Walden University

2017

Abstract

The birth of low weight babies in the United States has not had a meaningful decline for the last 10 years. It continues to be a major predictor of fetal-infant mortality. In addition, the rate of low birth weight infants among African American women continues to be twice that of European American women. Low birth weight baby may experience breathing problems, vision problems, diabetes, hypertension, and cerebral palsy. The purpose of this study was to examine why the high infant mortality rate persist among the African American communities of Southeast Queens, New York City as compared to European America communities in the Borough of Queens , New York City. This was a quantitative retrospective study with a correlational design that utilized secondary data, derived from vital records maintained by the New York City Department of Health and Mental Hygiene. The investigation was guided by the ecological model as the theoretical framework to collect, assesses, and analyze the data. Logistic regression was used to predict the association of risk factors to infant mortality. Low birth weight, preterm birth, late or no prenatal care, and smoking during pregnancy were some of the risk factors associated with a high mortality rate among African American women. Positive social change implications for this study include the development of a social intervention that will be culturally based for the diverse population in the communities of Southeast Queens, New York City. There will be a collaborative effort in implementing the evidence-based interventions involving interested stakeholders.

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Dedications

I dedicate this dissertation to my beloved sister Elizabeth Taylor, who did not live to see me complete this milestone. She succumbed to her illness on March, 2016. I thank my sister for the encouragement she gave me when I informed her that I was enrolling in the PhD program for public health. Her interest and support of my topic for my dissertation was rewarding to me. Thank you again for being my supportive sister and best friend. To my niece Cassandra Joy, who was my rock throughout this process. I will not forget the many nights I would awaken you to edit my work. Last but not least I cannot forget my nephew Stanley. Thank you for your support and checking me nightly to ensure that I had completed or was in the process of completing my weekly assignments.

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A special thanks to my committee, Dr Vibha Kumar and Dr. Bernice Kennedy for the tremendous amount of support throughout this process. To my chairperson Dr. Vibha Kumar, an enormous debt is owed for supporting me through the many extensions I applied for in order to complete my dissertation. This was a long journey, but a great rewarding learning experience.

Table of Content

List of Tables

List of Figures

Chapter 1: Introduction to the Study

Low birth weight (LBW) and preterm birth (PTB) have been the causes of a high infant mortality among African American women. The infant mortality rate (IMR) for any given region is generally defined as the number of children dying under 5 years of age, divided by the number of live births during one year, multiplied by 1,000 (Andrews, Brouillette, & Brouillette 2008). The risk of a child dying before completing the first year of age was highest in the World Health Organization (WHO) African Region (55 per 1000 live births), over five times higher than that in the WHO European Region (10 per 1000 live births). Infant mortality is a barometer that indicates the level of health and development of a population, and is a component of the physical quality of life index (Gray, Hollowell, Brocklehurst, Graham, & Kurincuk, 2009). Infant mortality is a global problem that mostly affects the less well economically developed countries. Africa and Asia have significantly higher infant mortality per 1000 live births than the better developed countries in the West. According to the World Factbook (2012) the two highest IMRs were in Afghanistan (121.64 ‰) and Niger (109.98 ‰) whilst the lowest IMRs were in Japan (2.21 ‰) and Monaco (1.80 ‰). The WHO, (2016) reported that in 2015, a total of 4.5 million (75% of all under-five deaths) occurred within the first year of life. The risk of a child dying before on1 year old was highest in the Africa (55 ‰), over five times higher than that in Europe (10 ‰).

In the United States the IMR had decreased significantly in the last half century due to medical advances and improvements in the provision o**f** health care. The IMR

declined from 20‰ in 1970 to 6.9 ‰ in 2003 (MacDorman & Mathews, 2011). More recently, the IMR in the United States has decreased to a historic low of 5.8 ‰ in 2014 (Centers for Disease Control & Prevention, [CDC], 2015).

Among the developed countries, United States currently has the highest infant mortality rate, where, in 2014, there were 582.1 infant deaths per 100,000 live births (MacDorman & Matthews 2013). An infant born in the United States is three times more likely to die than a baby born in Japan (World Health Association, 2016).Although, there has been a decline in the overall IMR in the United States, a disparity gap has arisen between the infants of Black/African American women and their White / European American counterparts. The Black/African American IMR was 13.50% in 2000 and 13.63 ‰ in 2005. In comparison, the White/European American IMR was lower, specifically 5.70 ‰ in 2000 and 5.76 ‰ in 2005 (MacDorman, Hoyert, & Mathews, 2013).

This study focuses on the risk factors associated with the differences in infant mortality among Black (non Hispanic) African American women in the communities of Southeast Queens, New York City compared to the European (non Hispanic) American women in the Borough of Queens, New York City. The findings of this study were needed to provide public health practitioners with the tools to implement interventions to help decrease the high infant mortality in Southeast Queens communities. The findings will also assist community's leaders and their stakeholders to prioritize the use of the available limited resources they may currently possess**.**

The social change that may result from this study was based on the principle of social justice. It was a matter of social justice that culturally based resources should be afforded to all mothers in the United States, irrespective of their ethnic origin (Peck, Sappenfield, & Skala, 2010). If resources were provided to some ethnic groups to maintain a low infant mortality, then culturally based resources should also be provided to ethnic groups experiencing a high infant mortality. Public health practitioners should collaborate with community leaders and other interested partners to ascertain the intervention(s) that was best for the community. This could cause a downward trend in infant mortality and help to eliminate the disparity gap**.**

Background of the Study

Many researchers have attempted to determine the complex reasons why infant mortality remains higher among Black/African American women than among other ethnic groups in the United States. Some combinations of risk factors cited in the literature include low birth weight (LBW), preterm birth (PTB), timing of prenatal care, the mother's socioeconomic status, as well as her communities' social and physical environment (Cox, Zhang, Zotti, & Graham, 2011; Dominguez, 2010; Dunlop, Salihu, Freymann, Smith, & Brann (2011); Gray et al., 2009; He, Akil Aker, Hwan, & Ahmad, 2015; Howell, 2008; Ehrenthal, Wingat & Kirby, 2011; Khanani, Elam, Hearn, Jones, & Masaru, 2010; Kistansas & Gaffney, 2010; Lhila & Long, 2012; Matthews & MacDorman, 2010; 2013; Miranda, Maxson, & Edwards, 2009; Rowley & Hogan, 2012;

Singh & Kogan, 2007; Schempf, Kaufman, Messer**,** & Mendola, 2011, Taylor, 2010; Lau, Ambalavanan, Chakraborty, Wingate, & Waldemar, 2013).

Additional risk factors directly associated with the mother's status, behavior, or condition that may affect the outcomes of pregnancy ,and add to the IMR, included maternal age (Hamilton , Martin, Osterman, Curtin, & Matthews (2015); maternal obesity (Chen, Feresu, Fernandez & Rogan, 2009; Mantakas & Farral, 2010); maternal marital status (Balayla, Azoulay, & Abemheim, 2011); maternal use of tobacco (Azimi & Lofti, 2013; Salihu, Aliyu, Pierre-Louise, & Alexander, 2013; Wikström, Cnattingius, & Stephansson, 2010); maternal use of alcohol (Lobel, Cannella, Graham, DeVincent, Schneider et al. 2008) and medical conditions during pregnancy including hypertension (Ananth & Basso, 2010); and diabetes (Persson, Norman, & Hanson, 2010).

The national trend in the ethnic disparity gap in IMR that exists among the US population was reflected in the Borough of Queens, New York City. Ten years ago, the IMR in Southeast Queens communities among African American women was twice that of European American women residing in the Borough of Queens (New York City Department of Health and Mental Hygiene [NYCDHMH], 2006; Williamson, Abe, Bean, Ferre, Henderson, et al. 2008). Further research was needed because, despite interventions, high infant mortality continues to be an important health problem in the Southeast Queens communities that needs to be addressed and rectified. Policy makers, community leaders, and other interested stakeholders may be able to apply the findings of this study in

practice to secure resources that will blend with the culture of the communities affected by a high IMR. Implementing new interventions that provide resources aimed at lowering the IMR of African American infants born in Southeast Queens may achieve the goal of eliminating the disparity gap. If this gap was allowed to persist, it will continue to adversely affect the differences in IMR between ethnic groups in Queens and other parts of the United States**.**

Problem Statement

The problem examined by this study was the disparity gap in infant mortality that has been reported to exist in the Queens, New York City communities between the African American and the European American mothers. It was necessary to conduct more research to explain why infant mortality was highest among the Black/African American (non Hispanic) community in Southeast Queens.

The causes of higher infant mortality in the Southeast Queens community compared to the Queens Borough community were complex and not entirely understood. New York City Department of Health and Mental Hygiene (2006) found that the demographics (age, sex, income, and education) of the two communities were similar. Southeast Queens communities ranked in the top ten for achieving the following goals: had a regular doctor, had a safe healthy home, was screened for cancer, and maintained a healthy heart. The only goal not achieved in 2006 was giving birth to a “healthy baby”. The proportion of babies born with LBW was 12% higher in Southeast Queens, than in Queens Borough.

Some of the reasons that may have contributed to the failure of this goal were that one third of the mothers had late or no prenatal care. The main conclusions were that the high IMR among Black/African American women residing in Southeast Queens, were caused by (a) lower birth weight (LBW) and (b) late or no prenatal care, resulting in more preterm births (PTB). In the last decade there has been no other research conducted in Queens to corroborate or elaborate these conclusions.

The conclusions of the NYCDHMH (2006) have been corroborated by more recent research confirming that LBW was a determinant of mortality, morbidity, and disability during infancy (Miranda, et al., 2009; Ehrenthal, Wingat & Kirby, 2011). Lau, Ambalavanan, Chakraborty, Wingate, & Waldemar (2013) analyzed U.S. birth and infant death data to determine the contributions of birth weight and gestational age on trends in IMR. The conclusion was that an increase in the proportion of low birth weight infants contributed to a lack of a decrease in IMR between 2000 and 2005. Child Health USA (2014) reported that preterm babies (born before 37 weeks of gestation) and/or with low birth weight (less than 2,500 grams) were at an increased risk of life-threatening health problems. As a result of this increased risk, preterm birth and low birth weight were the leading causes of infant mortality in the United States.

The conclusions of the NYCDHMH (2006) were also supported by recent research concluding that if pregnant women start prenatal care after the first trimester, or had no prenatal care, then the baby was at a higher risk of being born prematurely with LBW and a higher risk of mortality (Figueiredo, Filho, Lunardi,

& Pimpao, 2012; Hollowell, Oakley, Kurinczuk, Brocklehurst & Gray, 2011; Kramer & Hogue, 2009; Singh, Paillikadvath, Ram, & Alagajaran, 2013).

A literature review indicated, however, that there could be many other factors, apart from LBW, PTB, and/or late or no prenatal care, to explain why there was a disparity gap in infant mortality between the Black/African American and the White/European American mothers in Queens, New York City communities. The other risk factors for high infant mortality may include various social, environmental, and historical characteristics which were explained by the ecological model (Alio, et al., 2010).

The gap in knowledge concerning the reasons for the disparity in infant mortality among Queens, New York City communities provides a rationale and direction for the current research. This gap could potentially be filled by collecting and analyzing more recent data on the risk factors for infant mortality in Queens, New York City communities.

Purpose of the Study

The purpose of this quantitative study was to explore, using a correlational research design, the possible reasons for the higher infant mortality experienced by Black/African American (non Hispanic) mothers in South East Queens New York City compared to White European (non Hispanic) mothers in Queens Borough, New York City. The study population consisted of all Black (non Hispanic) and White (non Hispanic) mothers in the Southeast Queens and Queens Borough communities and their infants born between 2001 and 2012 inclusive.

The dependent or criterion variable was infant mortality (a combination of perinatal and postnatal mortality). The independent or predictor variables **,** hypothesized to be possible risk factors for infant mortality, were as follows: mother's community, mother's ethnicity, year of infant's birth, infant's birth weight, infant's gestational age, mother's age, mother's education, mother's marital status, mother's occupation status, mother employed during pregnancy, location of birth, prenatal visit in first trimester, medical risk factor: diabetes and hypertension; tobacco use during pregnancy; alcohol use during pregnancy, and drug use during pregnancy.

Research Questions and Hypothesis

The overarching research questions that guided this study were as follows

RQ1: Is there a significant difference in infant mortality rate among African American (non Hispanic Black) women residing in the communities of Southeast Queens, New York City compared to the European American (non Hispanic White) residing in the Borough of Queens, New York City?

Ho1: There is no significant difference in the infant mortality rate among the African American women residing in the communities of Southeast Queens, New York City and European American women residing in the Borough of Queens, New York City.

$H_1 1$: There is a significant difference in the infant mortality rate among African American women residing in the communities of Southeast Queens, New

York City and European American women residing in the Borough of Queens, New York City.

RQ2: Is there an association between infant mortality rate and infant characteristics of low birth weight, gestational age or preterm birth among African American women residing in the communities of Southeast Queens, New York City compared to European American residing in the Borough of Queens, New York City?

Ho2: There is no association between infant mortality and infant characteristics of low birth weight, gestational age or preterm birth among African American women residing in the communities of Southeast Queens, New York City and European American women residing in the Borough of Queens, New York City.

$H_1$2: There is an association between infant mortality and infant characteristics of low birth weight, gestational age, or preterm birth among African American women residing in the communities of Southeast Queens, New York City and European American women residing in the Borough of Queens, New York City.

RQ3: Is there an association between infant mortality and the mother's characteristics of age, marital status, initiation of prenatal care, unhealthy behavior, and community characteristics of education, occupation, and location of birth among African American women residing in the communities of Queens,

New York City and the European American residing in the Borough of Queens, New York City.

Ho3: There is no association between infant mortality and the mother's characteristics of age, marital status, initiation of prenatal care, unhealthy behavior, and community characteristics of education, occupation, and location of birth among African American women residing in the Southeast Queens, communities and European American women residing in the Borough of Queens, New York City.

$H_1$3: There is an association between infant mortality and the mother's characteristics of age, marital status, initiation of prenatal care, unhealthy behavior, and community characteristics of education, occupation, and location of birth among African American women residing in the Southeast Queens, communities and European American women residing in the Borough of Queens, New York City.

For over 20 years there have been many arguments in the literature, suggesting that the theoretical framework underpinning the concept of the null hypothesis has collapsed and that the testing of null hypotheses was obsolete (Halsey, Curran-Everett, Vowler, & Drummond, 2015; Hubbard & Lindsay, 2008; Hurlbert & Lombardi, 2009; Krueger, 2001; Leven, 1998; Nickerson, 2000; Nuzzo, 2014). Consequently, the classical dichotomous decision rule, devised nearly 100 years ago, to reject or retain the null hypothesis, depending on the results of inferential statistical analysis, was not applied in this study.

Theoretical Framework

The ecological model was applied in this study to underpin the analysis of infant mortality disparities between ethnic groups. The ecological model was proposed by Alio, et al. (2012) to explain how ethnic disparities in infant mortality may stem from a combination of four dimensions: (a) infant characteristics (e.g., LBW, PTB); (b) parental characteristics (e.g., mother's age, ethnicity, marital status, prenatal visits; medical risk factors (e.g., diabetes and hypertension, and mother's behaviors during pregnancy, including use of tobacco, alcohol, and drugs); (c) a confluence of community and social factors (e.g., mother's education, occupation, and location of the birth of her infant); and (d) the historical context . In the literature review, the theoretical foundation of the four dimensions was explored, recent literature utilizing the ecological model was cited, and the shortcomings of the ecological model were considered.

The shortcomings of the ecological model were considered by referring to the contextual model of family stress (Boss, 2003; Mosley & Chen, 2003). This model posits that disparities in infant mortality were arguably attributed to a combination of variables, one of the most important of which was family stress. The unique role of family stress among Black/African American mothers as a risk factor for high infant mortality (Rosenthal & Lobel, 2011) was therefore mentioned in the theoretical framework.

The perinatal periods of risk (PPOR) model (Peck et al., 2010) was also considered as an alternative theoretical framework for this study. This model

proposes four risk periods for infant mortality that are defined by two dimensions, specifically the age of the fetus-infant at death , and the birth weight (Peck et al., 2010). Age at death was separated into three distinct periods: fetal deaths, neonatal death, and postnatal deaths. Birth weight was separated into two groups: 500-1,499 g and ≥1,500g. The four risk periods were defined by:

1. Maternal Health /Prematurity: (fetal deaths at age ≥ 24 weeks with birth weight 500-1,499 g, and infant deaths at ages 0 -27 days and 28-264 days; with birth weight-500-1,499 g;
2. Maternal Care: (fetal deaths with birth weight ≥ 1, 500 g;
3. Newborn Care: infant deaths at age < 28 days with birth weight ≥ 1,500 g.
4. Infant Health (infant death at age 28 to 364 days with birth weight ≥ 1,500 g.

The PPOR model was applied in practice to reduce infant mortality by identifying and targeting groups of infants that were at the highest risk (Burns, 2005).

Nature of the Study

The nature of this study was a retrospective analysis of secondary archival data obtained from the New York City Department of Health and Mental Hygiene. Descriptive and inferential statistical analysis was conducted to (a) compare the infant mortality from 2001 to 2012 in two Queens, New York City communities (Queens Borough vs. Southeast Queens) between the African

American (Black/Non Hispanic) and the European American (White/ Non Hispanic) mothers; and (b) explore the effects of infant characteristics, parent and family characteristics, community characteristics, and historical context on the infant mortality. The study group lived in Southeast Queens and the reference group lived in Queens Borough. The reference group data were subject to the same analytic preparation as the study group data.

A correlational research design was appropriate in order to create empirical models that may predict future events from current data (Curtis, Comiskey, & Dempsey, 2016). The empirical models created in this study explored the statistical relationships between one dependent or criterion variable (infant mortality) and several independent risk factors that may be predictors of infant mortality. The risk factors, based on the ecological model (Alio et al., 2010) were as follows: mother's community, mother's ethnicity, year of infant's birth, infant's birth weight, infant's gestational age, mother's age, mother's education, mother's marital status, mother's occupation status, mother employed during pregnancy, location of birth, prenatal visit in first trimester, medical risk factor: diabetes and hypertension; tobacco use during pregnancy; alcohol use during pregnancy, and drug use during pregnancy.

Definition of Terms.

Key words used in the proposal will be defined in this section.

Allostasis: Is defined as maintaining a balance of the body systems that respond to stressors. An adaptive process that maintain homeostasis through the production

mediators such as adrenalin, cortisol, and other chemical messengers following acute stress (McEwen, 2005).

Allostatic load: Is defined as the damaging effect that over activity of mediators such as, adrenalin, cortisol, and other chemical messengers have on the wear and tear of the body and brain in response to stress. It is thought that repeated episodes may be the cause chronic diseases (McEwen, 2005).

Conception: The period following fertilization of the female ovum (egg) by the male sperm until the birth of the infant. Usually for a period of 9 months (CDC, 2010).

Disparity gap: Is defined as the difference in health outcomes and their determinants (such as, social, environmental, and geographic) between segments of the population (James, 2009 & OMHD, 2009).

Fetus: An unborn offspring from the embryo stage, (the end of the 8th week after conception, when the major structures have formed), until birth (Merriam-Webster, 2007).

Fetal mortality: A death that occurs 24 plus weeks of gestation to less than 7 days after birth per 1,000 live births (Peck, Sappenfield, & Skala, 2010).

Gestation: A period that start from conception to 37-41 weeks (Taber's Cyclopedic Medical Dictionary, 22nd ed).

Infant mortality rate (IMR): The total number of infant deaths per 1,000 live births divided by the number of births for that year. Also, includes neonatal deaths and post neonatal deaths (Burns, 2005; Gray, 2009).

Low birth weight (LBW): An infant born with a weight less than or equal to 2,500 grams (March of Dimes, 2008).

Maternal death: The number of pregnancy related deaths occurring within one year after pregnancy divided by 100,000 live births (Taber's Cyclopedic Medical Dictionary, 22nd ed).

Neonatal mortality: Death of a neonate less at less than 28 days of gestation (Peck et al., 2010).

Perinatal mortality: Death occurring from 28 weeks of gestation to less than 7 days after birth (Andrews et al., 2008).

Postnatal mortality: Death occurring from 7 days to 364 days divided by 1,000 lived birth (Peck et al., 2010).

Prenatal care: A set of interventions given a woman of reproductive age with an emphasis on health issues that require action before conception or very early in the pregnancy; the medical care a woman or man receive from a medical provider that focuses on the parts of health that have been shown to increase the chances of having a healthy baby or a healthy lifestyle and no children (Frey & Files, 2006).

Pregnancy: The fertilization and development of one or more offspring in a woman's womb. Divided into three periods called trimesters, which are of three months duration. Prenatal care should begin in the first trimester (CDC, 2011).

Preterm birth (PTB): Infants born before 37 weeks of gestation and weight is less than 2,500 grams (March of Dimes, 2008.

Assumptions

The following assumptions concerning this study were made:

1. The sample data were drawn from the communities of Queens and were representative of the population of the borough of Queens.
2. Accurate data were obtained from the New York City Department of Health and Mental Hygiene concerning the infant characteristics, maternal characteristics, social and community characteristics, and historical context.
3. Gray et al. (2009) highlighted that the process of estimating infant mortality is never 100% accurate. Anthopolos & Becker (2010) suggested that most government statistics underestimate IMR. Consequently, the assumption of the provision of accurate data may be violated.

Limitations

The data provided by the New York City Department of Health and Mental Hygiene that were used to estimate infant mortality (coded as "Born Alive Now Dead" or " Born Alive Now Living") in the database, appeared to refer to a combination of perinatal and postnatal mortality, but excluded fetal and neonatal mortality. The ages of the infants at death (indicated by the dates of occurrence or registration of death) were not provided by the NYCDHMH (2006). The data were therefore limited because it was not possible to distinguish between perinatal and postnatal mortality. Nor was it possible to estimate IMR using the common definition as the total number of infant deaths per 1,000 live births divided by the number of births for that year, also including neonatal and post neonatal deaths (Burns, 2005; Gray, 2009).

Because this retrospective study was based only on secondary archival data applying to two Queens communities by the New York City, the findings may have no external validity, meaning that they cannot necessarily be generalized to the other boroughs in New York City, or to other communities, at other times, and in other places. The limitation of a correlational design is that "correlation does not imply causation" meaning that it is not possible, through statistical analysis of secondary/archival data, to prove the existence of cause and effect relationships between variables (Pearl, 2009, p. 96). To prove causation, a controlled experiment must be performed; however, when two variables collected using a non experimental research design are correlated, and one frequently precedes the other (e.g., preterm birth frequently precedes infant mortality) then the correlation provides circumstantial evidence in favor of causation (Curtis et al., 2016).

Delimitations

Only the infants of non Hispanic Black/African American and non Hispanic White/European American women of child bearing age residing in the Borough of Queens were included in this study. The perinatal periods of risk (PPOR) model could not applied as the theoretical framework to underpin this study, because the PPOR distinguishes between fetal, neonatal, perinatal and postnatal mortality, classified by age and birthweight (Peck et al., 2010). The data provided by the NYCDHMH, (2006) excluded the age at death of the infants, therefore the PPOR model could not be applied.

Significance of the Study

This study used the theoretical framework of the Ecological Model (Alio et al. 2010) to explore the risk factors for the high infant mortality that exists in the Southeast communities of Queens, New York City. This model should provide the information that the communities of Southeast Queens can use to evaluate the resources that will be needed to decrease the high rates of infant deaths. Public health practitioners, community stakeholders, and political leaders may discover that the model provides evidence based solutions that will decrease the infant mortality in the population that has the highest rate.

The positive social change implications for this study include knowledge that public health practitioners and healthcare providers can use to improve the health and health outcomes for mothers and infants that will cause a decline in the fetal-infant mortality. The knowledge from this study will assist political leaders in making decisions on allocation of resources that the mother need in order to have a healthy normal weight baby. Babies of normal weight do not experience the disabilities that low weight babies encounter during their growth and development periods.

Summary

Researchers have investigated the disparity in the infant mortality of different ethnic groups, applying several theories, for decades; however, no meaningful interventions have had an effect on decreasing the existing high mortality rates among Black/African American communities. African American mothers will benefit from the data provided by the current research. The findings will assist public health practitioners to implement evidence-based interventions that may have a positive outcome on the IMR

in the Southeast Queens, New York City communities. The implications for social change include the possible elimination of the disparity gap for women, infants, and families, resulting from a decrease in the African American IMR.

Chapter 2 will present a detailed review of the literature and the framework for the study will be discussed in depth.

Chapter 2: Literature Review-Introduction

This literature review was based on published information concerning infant mortality and interventions for the prevention of infant mortality. The review focused on research that considered the causes of the disparities in infant mortality that were to the detriment of African American mothers in the United States, especially in the Southeast Queens, New York City communities. To obtain an overall picture of the causes of the disparity gap, the literature review was structured according to the four components of the ecological model (Alio et al., 2010) with reference also to the Family Stress Model (Boss, 2003; Mosley & Chen, 2003). This review therefore included publications that consider (a) the characteristics of the infant; (b) the characteristics of the mother including her behaviour prior to and during pregnancy; (c) social, community, environmental factors; and (d) the historical context.

Articles for the literature review were acquired in various ways. Initially the Walden University library was used to procure articles using the following databases: EBSCO, CINAHL Plus, CINAHL, MEDLINE, Sage and the Annual Review of Public Health. The above sites provided full text articles and peer review articles in the PDF format. Approximately 65 articles were retrieved. Other sites used included Pubmed, ERIC, Proquest, and Google Scholar. These sites provided mostly abstracts and a few peer review articles linked to other sites. However, ERIC offered some articles that could be accessed from their site. The Goggle Scholar provided sites that required additional searching and yielded articles of interest. The National Library of Medicine offered no results on the topic. The sites of professional journals such as, The New England Journal

Medicine, Pediatrics, Lancet, and the American Journal of Public Health yielded useful articles. The following agencies maintain a maternal-child health site: CDC, USDHHS, NIH, IOM, OMHD, and the March of Dimes. The search words that were used to retrieve articles include preterm birth, low birth weight, African American, health disparity, birth outcome, infant mortality, ecological model, family stress model.

Disparity Gap in Infant Mortality

The most recent infant mortality rate data for the United States in 2010 was illustrated in Figure 1 (from Matthews, 2013). The data highlights the disparity gap between the IMRs of the children of White (non Hispanic) mothers and Black (non Hispanic) mothers between 2000 and 2010.

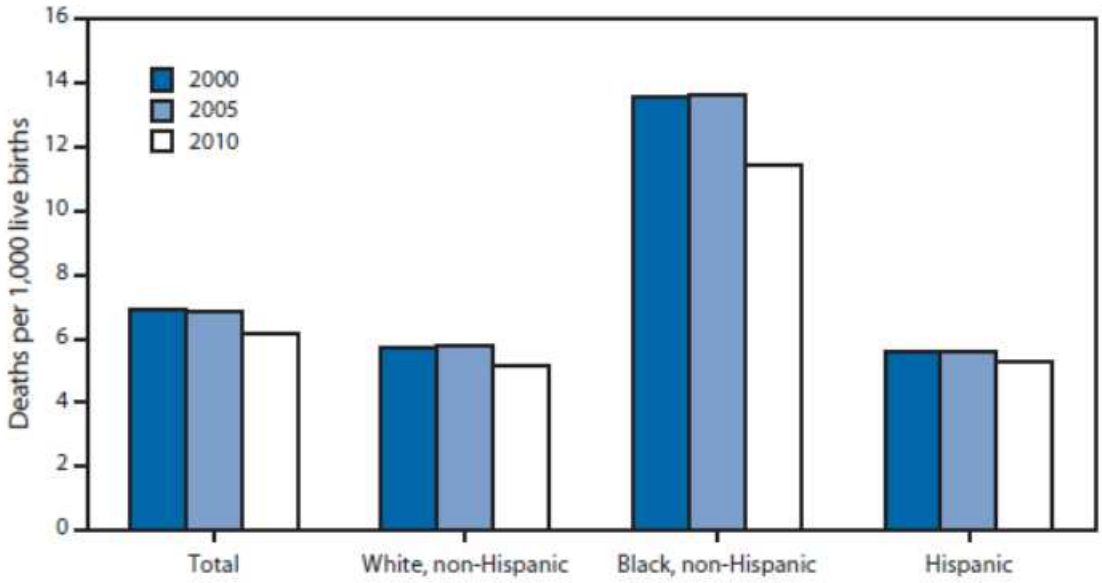

Figure 1 IMR disparity between the children of White, non Hispanic mothers and Black, non Hispanic mothers in the United States from 2000-2010

Although the IMR for non Hispanic Black mothers declined down to 11.46 deaths in 2010, the non Hispanic black mothers continued to report an IMR

that was 2.2 times higher than non Hispanic White mothers. The reason why non Hispanic Black infants are more than twice as likely to die than non Hispanic White infants cannot be totally accounted for by socio-economic or genetic risk factors. Despite their lower levels of educational attainment and socio-economic status, Hispanic mothers have a comparable IMR to non Hispanic white mothers (Osel, 2008).

More recent data reported by the National Center for Health Statistics (2014) illustrated in Figure 2 shows that in 2011, the percent of deaths per 1000 live births was 11.42% among Black Non Hispanic Women compared to 5.11% among White Non Hispanic Women

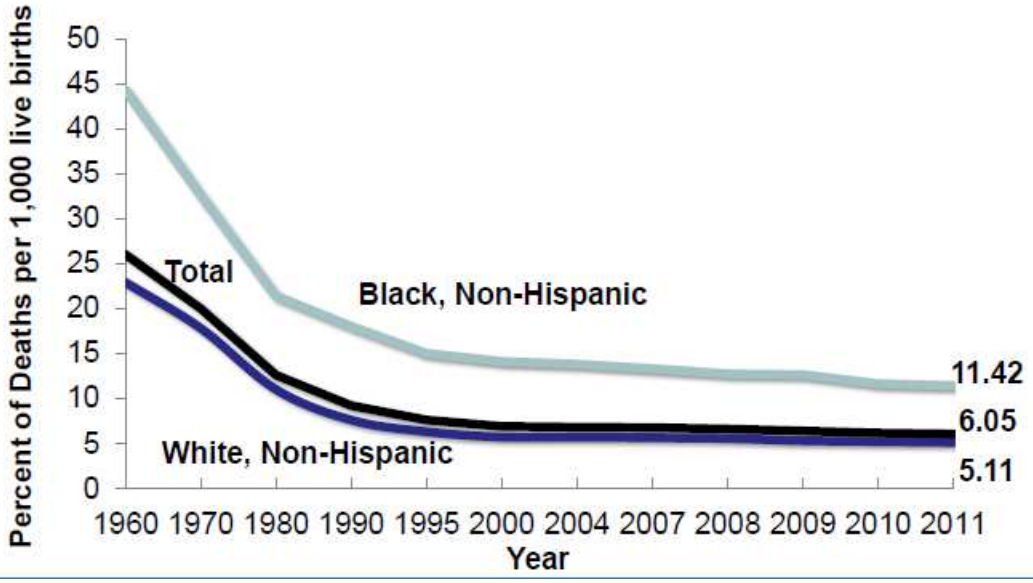

Figure 2. Disparity in infant mortality between Black and White mothers, 1960-2011.

Ecological Model

The main theoretical framework underpinning this study was the ecological model, originally proposed by McLeroy, Bibeau, Steckler, & Glanz (1988) as a framework for health promotion programs. This model incorporates an environmental component, comprised of factors such as the influence of institutions, organizations, communities, and political policies on public health. The model also included individual and interpersonal factors. The model highlighted the importance of interventions directed at changing factors which support and maintain unhealthy behaviors. The model posited that changes in the social environment should axiomatically create changes in individuals. The ecological model was further developed by Alio et al. (2010) to explain the differences in infant mortality between Black and White ethnic groups. The ecological model classifies two levels of determinants of infant mortality, the inner-most and outer-most. The inner-most level comprises infant characteristics, parental characteristics, and community and society characteristics that may have an influence on disparities in infant mortality. The outer-most level was the historical context.

The inner-most unit of the ecological model was the infant. This unit identifies medical conditions that were more prevalent in Black than White infants, including low birth weight, preterm birth, sudden infant death syndrome (SID), preventable injury, respiratory distress syndrome and congenital anomalies. The second unit of the inner level consists of parental characteristics that may distinguish between Black and White parents, including maternal age, single parenthood, maternal behaviors (e.g., prenatal care visits, use of substances, and infant-rearing practices). The third unit in the inner level

consists of community and society characteristics that may differ between Black and White families, including socio-economic status (a function of paternal education and occupation) and access to quality healthcare. The outermost level of the ecological model was the historical context, which includes the development of stressors over time, especially racism, as a cause of the disparities in infant mortality between Black and White communities.

Infant Characteristics

The first unit of the ecological model was infant characteristics. The literature provides considerable historical evidence to indicate that low birth weight (LBW) was a major causes of the disparity gap in mortality between Black and White infants in the United States and elsewhere (Alexander, Kogan, Bado, Carlo, Allen, et al., 2003; Alexander, Wingate, Bader, & Kogan, 2008; Byrd, 2007; Branun, 2002; CDC, 2004; Hamilton, Martin & Ventura, 2010; Kitsantas & Gaffney, 2010; Matthews & Keppel, 2005; Matthews & MacDorman, 2010; Owusu-Ansah & David, 2008; Schempf et al., 2007).

The latest available data on the outcomes of LBW infants (Child Health USA, 2014) confirmed the existence of significant racial disparities in low birth weights between different ethnic groups in the United States. The proportion of infants born with LBW in 2009 was significantly higher among non Hispanic Black mothers (13.6%) than infants born to mothers of other ethnic groups. The second highest proportion of LBW infants was among Asian/Pacific Islanders (8.3%) followed by American Indian/Alaska

Natives (7.3%). The lowest proportion of LBW was among infants born to non Hispanic White women (7.2%) and Hispanic women (6.9%).

Matthews & MacDorman, (2010) reported that the risk of infant mortality increased significantly with decreasing gestational age. The IMR for very preterm infants was 74 times that of full term infants. The IMR for infants born at 32–33 weeks was nearly seven times that of full term infants. The latest available data on mortality associated with preterm births reported by the National Center for Health Statistics (2014) illustrated in Figure 3 reflected the disparity in the causes of infant mortality for non Hispanic Black vs. non Hispanic White mothers. Preterm related causes accounted for 3.36 times more infant mortality among the Black compared to the White mothers. Furthermore the mortality rate due to other causes (congenital malformations, SIDS, and unintentional injuries) was higher among the Black infants than among the White infants.

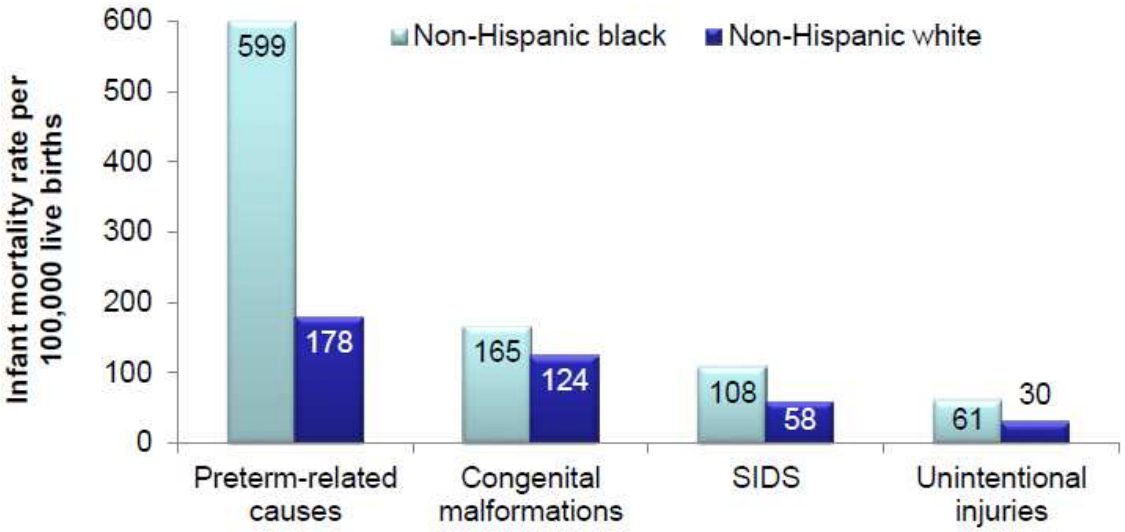

Figure 3. Disparity in the causes of infant mortality among non Hispanic Black and non Hispanic White mothers

LBW and PTB were correlated risk factors for infant mortality, because preterm babies also have a low birth weight (Alexander et al., 2003). Nevertheless, the two risk factors were generally examined separately because of multiple births, which cause an even greater disparity of LBW and PTB between Black and White infants (Dunlop et al., 2011).

Paternal Characteristics

Maternal age was one of the most important paternal characteristic linked to low birth weight that determines infant mortality. Lhila and Long (2012) found that the risk of LBW increased with older maternal age. The latest available data (Hamilton , et al., 2015) revealed that low birth weight was highest among babies born to very young women aged than 15 years of age (12.4%), followed by babies born to older women aged 40–54 years (11.8 %) . The lowest proportions of LBW babies were born to mothers aged 25–29 years and 30–34 years (7.4% and 7.6%) respectively.

Additional risk factors directly associated with the mother's status, behavior, or condition that may affect the outcomes of pregnancy, and add to the IMR, include maternal obesity; maternal marital status; maternal use of tobacco and alcohol, medical conditions during pregnancy including hypertension, diabetes, and the mother's timing of prenatal care.

Chen et al., (2009) studied the relationship between maternal obesity and the risk of infant death using a case control study. Compared with women with a normal body mass index (the controls) the obese women with a body mass index > 30 (the cases) had increased risk of infant mortality. The odds ratios computed using binary logistic

regression indicated that obese women were up to 2.87 more likely to experience the death of their infant than normal weight women. Other researchers have also found that increasing maternal body mass index had a deleterious impact on the outcomes of pregnancy (Mantakas & Farral, 2010; Gaudet, Ferraro, Wen, & Walker, 2014).

Balayla, Azoulay, and Abemheim (2011) evaluated the relationship between maternal marital status and infant mortality. Compared with married women, unmarried women were at an increased risk of perinatal and postnatal infant mortality (relative risk = 1.24). Among the unmarried women, women under 15 or over 40 years of age, Black/ African American women, and women who received no prenatal care were at an increased risk of perinatal and postnatal infant mortality. Lhila and Long (2012) also found that being unmarried was associated with an increased risk of LBW for Black mothers (odds ratio =1.3) but not for Whites mothers.

The mother's use of tobacco during pregnancy, even light smoking, has been found to reduce the birth weight of the infant, and hence increase the risk of infant mortality (Azimi & Lofti, 2013; Wikström et al., 2010).Salihu et al. (2013) concluded that excess levels of infant mortality were attributable to maternal smoking during pregnancy in the United States. Lobel, et al. (2008) explored several maternal behaviors before and during pregnancy, including smoking tobacco, drinking alcohol, and unhealthy eating habits, and found that these behaviors tended to increase the risk of infant mortality.

Medical conditions of the mother during pregnancy have been related to high infant mortality. Ananth & Baso (2010) found that higher infant mortality was associated

with hypertension, especially among multiparous and Black/African American women. Binary logistic regression predicted an increased likelihood of neonatal death (odds ratio =1.30) in first and second or subsequent births (odds ratio = 1.64). Among the multiparous mothers, the relationship between hypertension and stillbirth was stronger in Blacks (odds ratio = 2.93) than in Whites (odds ratio =1.98). Persson et al. (2010) conducted a case control study to compare the risks of infant mortality among Type I diabetics (the cases) vs. healthy women (the controls). Perinatal mortality was more likely among the cases that the controls (odds ratio = 3.29). The risk of preterm birth was also higher among the cases than the controls (odds ratio = 3.08).

The timing of prenatal care was an important risk factor. When a pregnant woman starts prenatal care after the first trimester, or had no prenatal care at all, the baby was at risk of being born prematurely with LBW (Kramer and Hogue, 2009). Lhila and Long (2012) found that access to prenatal care was associated with reduced risk of LBW among both Black mothers (odds ratio = 0.4) and White mothers (odds ratio = 0.4). Kitsantis and Gaffany (2010) suggested that the lack of access to quality healthcare, mothers not starting prenatal care in the first trimester, or not receiving prenatal care, were some of the factors fueling the disparity gap between Blacks and Whites.

Cox, et al. (2011) investigated the relationships between prenatal care, PTB, LBW and infant death among mothers in Mississippi, USA. Inadequate prenatal care was found to be an important risk factor. Black women tended to delay prenatal care and had less prenatal visits than White women. Regardless of ethnicity, inadequate prenatal care was a strong risk factor for PTB, LBW and infant mortality. The conclusion was that racial

disparities in the utilization of prenatal care were responsible for disparities in infant birth outcomes in Mississippi. Figueiredo et al. (2012) also found that in Brazil, the relationship between infant mortality and prenatal care was closely related to inadequate prenatal care. Likewise, Wilkinson et al. (2011) found that in countries where income inequality exists, there was a lack of access to quality healthcare which fosters a high infant mortality rate among families with low socioeconomic status.

Community and Society Characteristics

Community and society characteristics that may influence infant mortality include the mother's access to quality healthcare, and her socio-economic status (a combination of education and occupation). Howell, Hebert, Chattergee, Kleinman, & Chassim (2008) suggested that racial disparities in infant mortality were related to disparities in quality of care. They examined hospitals in New York City to determine if there was a difference in infant mortality where Black and White infants were born, and predicted that the mortality of Black infants would decrease by 4.8% if they were all born in the same hospitals as White infants. Lack of quality healthcare was more frequent in rural than in urban communities. Politzer, Yoon, Shi, & Hughes (2001) compared the outcomes at federally funded clinics in rural and urban communities. African American women in rural communities, who did not have health insurance, were provided primary healthcare. Some of the clinics reported a subsequent decline in the rural and urban disparity gap in infant mortality. A study conducted by Darling and Atav (2012) examined the cause of LBW in rural (62 counties) in New York State. The LBW rate was 8.2%. Variables such as, maternal age, socioeconomic factors, drug/alcohol use, and location were linked to the

cause of LBW. However, the authors reported that the prevailing causes of LBW in New York State were late or no prenatal care (starting prenatal care in the 3rd trimester), teenage pregnancy rate, and lack of access to quality healthcare. Approximately 25% of New York State population lived in areas that did not have access to adequate healthcare providers, because most obstetricians were opting out of practicing in rural areas

Socioeconomic status was a significant risk factor for high infant mortality among Black communities. African American Blacks were significantly more likely than European American Whites to be poor. According to Duckett & Artega (2013) African Americans were 2.5 times more likely than European American to have family income below the poverty level. O'Campo (2008) investigated neighborhood deprivation and preterm birth among non Hispanic Black and non Hispanic White women in eight geographic areas in the United States. The link between the exposure of Black mothers to neighborhood poverty and low socioeconomic status was found to have a deleterious impact on birth outcomes.

An outcome of poor socioeconomic status was little or no health insurance. The majority of Black workers (70%) were employed in jobs that typically provide low wages and did not offer health insurance coverage (Duckett & Artiga, 2013). People without insurance were less likely to receive preventive or routine medical care. Kirby & Kaneda (2011) reported that Black African American women were more likely to have no healthcare insurance than European American White women, resulting in Black/ African American women receiving lower quality health care than White/ European American women.

Elder, Goddeeris, and Haider (2013) reviewed the disparity gap between infant mortality among different ethnic groups in the United States, and concluded that this gap was not predictable by individual maternal characteristics (e.g., maternal marital status, education, age, health insurance, etc.). Each of these covariates was strongly related to income and poverty, and therefore poor socio-economic status was the overall determinant of higher infant mortality among Black/African mothers. Haider (2014) also ascribed ethnic infant mortality gaps to socioeconomic status. The researchers recommended that more comprehensive measures of socioeconomic status should be obtained in order to predict differences in infant mortality between different ethnic groups.

Historical Context

The historical context implies events that evolved over time that may influence infant mortality. Alio (2010) argued that, historically, Blacks were more susceptible to higher infant mortality because of the development of discrimination. Discrimination was the unjust or prejudicial treatment of different categories of people, particularly on grounds of race. Collins, David, Handler and Andes (2004) supported Alio's argument by finding that Black women who experienced discrimination were more likely to have a very LBW baby. Over ten years later, racial discrimination against Black women was still a significant factor related to many pregnancy and health related issues including high infant mortality (Hartil, 2014). The evolution of racial prejudice over time may overlap with poor socioeconomic status. An increasing lack of external resources in combination

with increasing racial discrimination may ultimately lead to increasing rates of infant mortality among Black communities (Elder, Goddeeris, & Haider, 2013).

Contextual Model of Family Stress

The ecological model may be criticized because of its complexity and inconclusiveness. Furthermore, the ecological model does not explicitly propose family stress as a factor to explain a high IMR (Boss, 2003; Mosley & Chen, 2003). The ecological model, however, implicitly includes family stress (encompassed within parent and family characteristics, community and society characteristics, and the historical context).

The contextual model of family stress consists of two dimensions: the external context, and the internal context. Both dimensions focus on the role of stress as a factor associated with infant mortality. The external context consists of elements that cannot necessarily be controlled, such as ethnicity, racism and socioeconomic status, whereas the internal context was composed of elements that can be controlled, including maternal behavior and quality of healthcare (Boss, 2003; Mosley & Chen, 2003).

Several studies have suggested that maternal stress had psychological and physiological consequences that may lead to deleterious birth outcomes for infants. Sawyer, Major, Casad, Townsend and Mendes (2012) suggested that limited access to health care, poor housing, unemployment, and racial prejudice were stressors associated with negative birth outcomes. Increased exposure to these stressors contributes to the disparities in many health issues among Black/African American communities. Dominquez (2010) described several stressors that were unique to Black/African

American women placing them at more risk of infant mortality compared to White/ European American women, including racial discrimination, and socioeconomic factors. Broekman, Chan, & Chong (2014) suggested that racial discrimination increases anxiety and depression during pregnancy resulting in low infant birth weight. Rosenthal & Lobel (2011) suggested other unique sources of stress among Black/African American women that may explain racial disparities in infant mortality, including distrust in, and abuse by, the healthcare system, which may be related to inadequate prenatal care.

The contextual model of family stress may appear to be superior to the ecological model, because of its simplicity (i.e., focusing only one overall determinant for infant mortality rather than a multitude of complex infant, maternal, community, societal, and historical issues. The contextual model of family stress was, however, difficult to operationalize by empirical research. Stress was not an easy psychometric construct to evaluate (Koolhas, Buwalda, de Boer, Flugge, Korte, et al. (2011). Because the stress of the participants in the current study was not measured, the contextual model of family stress could not be applied as the main theoretical framework.

Perinatal Periods of Risk Model

The ecological model and the contextual model of family stress attempt to explain the cause of the high African American infant mortality rate and explain why this high rate has persisted. However, none of the interventions that were implemented utilizing these theories have been successful in decreasing or preventing the high rate of African

American infant deaths. Moreover, they have not diminished the ethnic healthcare disparity gap.

The perinatal periods of risk (PPOR) model had been proposed to provide evidence based information that would help to reduce the African American IMR (Peck et al., 2010). The PPOR was free of complexities making it easy to communicate and be used by cities and their stakeholders. Despite its many benefits, few cities have used this model (Masho, Keyser-Marcus, Varner, Singleton, Bradford, Chapman, & Svikis, 2011).

The PPOR model was based on a concept developed by Dr. Brian McCarthy in the 1980s, along with WHO, and a group from CDC. Their model, named the periods of risk (POR) was used primarily in the developing countries to investigate the IMR. Dr. McCarthy's POR analytic framework included fetal and infant deaths, which were grouped according to birth weight and age at death. The deaths that could have been prevented (the opportunity gap) were recognized and linked to preventive strategies. Citymatch (n.d.), investigated a variety of models and decided that the POR model could be used in the United States by cities and local health department to address the high infant mortality rate (Peck & Sappenfield, 2010; Burns, 2005).

However, CityMatch (n.d.), made changes to the POR model that was beneficial to the user. Examples of the changes included combining similar causes of death and risk factors into four perinatal periods (Masho, 2011; Peck, 2010, Citymatch). The four perinatal periods of risk were linked to strategies that caused a decline in the IMR within the associated periods. The four perinatal periods of risk were maternal health/prematurity, neonatal care, newborn care, and infant health (CityMatch & Peck et

al.). For example, some of the causes of death in the infant health period were SIDs, falls, and infection (CityMatch).

The four periods of risk were measured quantitatively by birth weight and age at death. The birth weight for the maternal health/prematurity risk period was 500-1,499 grams, and for maternal care, newborn care, infant health, the birth weight was 1,500 - + grams. Age at death involves fetal death >or = 24 weeks of gestation, neonatal death 0-27 days of gestation, and postnatal death 28-364 days. Each of the ages was associated with one of the four risk periods. Therefore, infant deaths with a birth weight under 500 grams were not counted and fetal deaths with a birth weight under 500 grams, or the death occurred before 24 weeks after conception were not counted (Citymatch,n.d.).

Attached to each period of risk was an action plan with the goal of decreasing the chance of fetal or infant death. Another modification made by CityMatch, was the development of a national reference group for calculating excess deaths that exist between the study population and reference group (Peck et al., 2010, 285). The reference group had to meet the following criteria in order to be included in the study. The mother had to be one who experienced a low rate of fetal-infant deaths, had 13 years of education or more, had to be European American, over the age of 19 years, and lived in the city where the study was being conducted, and where she gave birth (Sappenfield et al., 2010; City Match). The underline principle connected to the reference group was social justice.

The PPOR model includes guidelines that assist with data collection and analysis. It also provides information that was needed to compare the study population of fetal-infant mortality in each period of risk with the rates of a reference group. Additional

information furnished by the model included the least amount of deaths needed to conduct the study, and the number of years to include in the analysis (Sappenfield et al.). The PPOR model has been used in New York City and the results indicate that the period of risk largely responsible for the disparity was the maternal health/ prematurity area. Interventions were suggested to help reduce the disparity gap by targeting resources to address this specific area (Besculides & Laraque, 2005).

The PPOR model could not applied as the theoretical framework to underpin the current study, because the PPOR distinguishes between fetal, neonatal, perinatal and postnatal mortality, classified by age and birth weight (Peck et al., 2010). The data provided by the NYCDHMH, (2006) excluded the age at death of the infants, therefore the PPOR model could not be applied.

Narrowing the Disparity Gap

LBW and PTB were global problems. Finding solutions that reduce the disparity gap by preventing the death of LBW and PTB infants were healthcare problems that public health providers needed to address on the global, national and local level (WHO, 2012; Ashdown-Lambert, 2005). The word disparity conveys the connotation that there were differences or inequalities in what were being offered for public use. When disparity was used in connection with healthcare, it become apparent that difference exist between racial/ethnic groups concerning health problems or allocation of resources. The burden of many diseases or illnesses largely affect people of color, mainly those with a low socioeconomic status and who were underinsured, or not insured (Eric Notebook, 2003).

Disparities can be encountered in health insurance coverage, access to treatment, and the use of healthcare services.

Some of the determinants of disparities in healthcare include the ability to pay for healthcare services, location (urban or rural), preferences and beliefs of the client and physician, cultural and language barriers, and the interpersonal relationship between client and physician (Giger, et al., 2007). Health disparities were concerned with illnesses, ailments, and other health problems that affect some ethnic groups at a higher rate than others. For example, according to Giger et al., racial/ethnic minorities were at a higher incidence and prevalence of chronic diseases that present with higher morbidities and mortalities. Even when minorities gain access to healthcare, they were not given the quality of healthcare afforded to European Americans.

WHO (2012) discussed global goals for every woman, infant, and child that resided in developing countries. The goals addressed inequalities that existed in the quality and the delivery of care to every woman, infant, and child. Countries that implemented WHO's goals have seen a decline in the IMR. Infant mortality and maternal mortality were global problems that affect all countries. Communities in which high IMR persist have a role in helping to reduce the IMR by modifying conditions within the communities that contribute to unhealthy behavior and lifestyle that add to the birth outcome (OMHD, 2007).

Although, the delivery of healthcare had improved for most of the US population, unequal treatment among ethnic groups was apparent, resulting in a cessation in the reduction and elimination of healthcare disparities (Thomas, Benjamin, Almario, &

Lathan, 2006; MacDorman & Mathews, 2013). The simplest solutions were not always successful. Holloway et al. (2011) evaluated the effectiveness of 15 prenatal care interventions to reduce infant mortality in socioeconomically disadvantaged communities. Only one program was found to have a beneficial effect on birth outcomes. More comprehensive solutions were necessary.

In the United States, conception health programs have been initiated and advocated by the Office of Minority Health and Health Disparities (OMHD, 2007) to improve the health of women before pregnancy. The ultimate goal of the program was to improve the health of women during the reproductive stage, the growth and development stage, and into old age. It was a culturally designed program that implements interventions before pregnancy to identify, treat, and help women to change unhealthy behavior that contributes to unfavorable maternal and infant outcomes. This program also aid in decreasing risk factors that affect future pregnancies. It provided a full range of preventive and primary care before the first pregnancy and extends to the healthcare provider the opportunity to expose and treat conditions that may become a threat during conception, post conception, and the inter-conception period. The effect of risky behavior to the developing fetus begins early in pregnancy, before a woman starts prenatal care. Identifying fetal-infant risk early in pregnancy allows for the implementation of measures which decreases and/or prevents unhealthy outcomes. This program should help to narrow the disparity gap that exists between the African American infant mortality rate and the European American infant mortality rate.

To increase awareness of the plight of African American infant mortality, a San Francisco town used social marketing to get the message out to the communities (Rienks & Oliva, 2012). The messages were delivered via advertisements and posters on buses, in waiting rooms, and churches along with radio advertisements. This was an excellent way to educate communities and engage people to participate in efforts to help reduce the disparity gap.

Healthy People 2020 are an organization that has taken up the challenge to reduce the disparity gap. The researchers suggest the disparity gap persists due to the high number of LBW infants that were born with the risk of dying before their first birthday (MacDorman & Mathews, 2011; OMHD, 2007). The inequality in the sharing of resources prevents mothers, infants, and children from receiving safe, affordable healthcare, which had an effect on the high African American IMR (David, 2007; Miranda, et al., 2009).

The goal of Healthy People 2020 is to improve the gap between the IMR of Black/African Americans and White/European Americans, along with improving the health of mothers, infants, and children. The ultimate goal is to eliminate health disparity across the population. Achieving these goals will have a beneficial effect on improving the health of the population and the African American IMR. Even when there was a decline in African American preterm birth and low birth weight infants from 1990 to 2006 this resulted in a slight decrease in the racial disparity gap and the IMR (Miranda, et al., 2009). According to MacDorman and Mathews (2013), infant mortality data have been collected for over 100 years and disparities existed since that time. This suggests

that infant mortality has continued and grown larger without a decline in the disparity gap. In order for the above factors to be eliminated social and economic inequality must be addressed (Braveman, Egerter, Cubbin, & Marchi, 2004; Wilkinson & Pickett, 2011).

Conclusions

The risk factors associated with the high infant mortality of Black/African Americans in Queens, New York City communities were complex. Although, interventions have been implemented targeting the disparity gap between the Black/African American and the White/European American infant mortality rate, none have been successful in decreasing this rate. Healthy People (2010) have the objective: (1) to decrease the high infant mortality rate and (2) narrow the disparity gap. However, these objectives have currently not been met.

The current study is underpinned by a theoretical framework that provides evidence-based information that can be used in implementing community based intervention. The four dimensions of the Ecological Model, specifically infant characteristics, paternal characteristics, community and society characteristics, and historical context (Alio et al. 2010) appear to be the most appropriate theoretical framework to identify the risk factors for high infant mortality, in order that resources can be targeted to benefit the most vulnerable sectors of the communities.

Chapter 3 describes the methods used to collect and analyze the secondary data used to address the research questions of this study. Chapter 4 presents the results of the study and addresses the research questions. Chapter 5 presents a discussion of the results

in the context of the literature, considers the significance of the study, the implications for social change, and recommendations for future research.

Chapter 3: Methods Introduction

The purpose of this quantitative study was to explore, using a correlational research design, the possible reasons for the higher infant mortality experienced by Black/African American (non Hispanic) mothers in South East Queens New York City compared to White European (non Hispanic) mothers in Borough of Queens, New York City. The study population consisted of all Black (non Hispanic) and White (non Hispanic) mothers in the Southeast Queens and Queens Borough communities and their infants born between 2001 and 2012 inclusive.

The dependent or criterion variable was infant mortality (a combination of perinatal and postnatal mortality). The independent or predictor variables , hypothesized to be possible risk factors for infant mortality, were as follows: mother's community, mother's ethnicity, year of infant's birth, infant's birth weight, infant's gestational age, mother's age, mother's education, mother's marital status, mother's occupation status, mother employed during pregnancy, location of birth, prenatal visit in first trimester, medical risk factor: diabetes and hypertension; tobacco use during pregnancy; alcohol use during pregnancy, and drug use during pregnancy.

Research Design and Approach

A retrospective analysis was conducted using secondary archival data obtained from the NYCDHMH (2006). Descriptive and inferential statistical analysis was performed to (a) compare the infant mortality from 2001 to 2012 in two Queens, New York City communities (Queens Borough vs. Southeast Queens) between the African American (Black/Non Hispanic) and the European American (White/ Non Hispanic)

mothers; and (b) explore the effects of infant characteristics, parent and family characteristics, community characteristics, and historical context on infant mortality.

A correlational research design was used to create empirical models that may predict future events from current data (Curtis, Comiskey, & Dempsey, 2016). The empirical models created in this study explored the statistical relationships between one dependent or criterion variable (infant mortality) and several independent risk factors that may be predictors of infant mortality.

Population

The population consisted of the infants of non Hispanic Black/African American women (the study group) and non Hispanic White/European American women residing in Queens (the reference group) between 2001 and 2012, New York City. The population of the borough of Queens, New York City was diverse and composed of the following racial/ethnic groups. European American 33%, African American 19%, Hispanic American 25%, Asian American 17%, and others 6%. However, the racial/ethnic makeups of the neighborhoods that comprise the communities of Southeast Queens were quite different. For Example, 55% of African American and 19% of European American live in Southeast Queens, New York City. However, in the neighborhood of Northwest Queens, the racial makeup is 6% African American and 43% of European American (NYCDHMH, 2006).

Instrument and Variables

Because this study was based on secondary/archival data, no specific instrument was used. The dependent variable was infant mortality. The independent or predictor

variables, representing the risk factors for infant mortality, based on the ecological model (Alio et al., 2010) were as follows: mother's community, mother's ethnicity, year of infant's birth, infant's birth weight, infant's gestational age, mother's age, mother's education, mother's marital status, mother's occupation status, mother employed during pregnancy, location of birth, prenatal visit in first trimester, medical risk factor: diabetes and hypertension; tobacco use during pregnancy; alcohol use during pregnancy, and drug use during pregnancy.

Data Collection and Analysis.

Upon receiving IRB approval, the New York City Department of Health and Mental Hygiene were contacted to supply the required data. The data were supplied as an SPSS data file. The statistical analysis of the data was conducted using SPSS vs. 20.0.

Research Questions and Hypothesis

The overarching research questions that guided this study were as follows:

RQ1: Is there a significant difference in the infant mortality rate among African American (non Hispanic Black) women residing in the communities of Southeast Queens, New York City compared to European American (non Hispanic White) women residing in the Borough of Queens, New York City?

Ho1: There is no significant difference in the infant mortality rate among African American residing in the communities of Southeast Queens, New York City compared to European American women residing in the Borough of Queens, New York City.

$H_1$1: There is a significant difference in the infant mortality rate among African American women residing in the communities of Southeast Queens, New York City

compared to European American women residing in the Borough of Queens, New York City.

RQ2: Is there an association between infant mortality and infant characteristics of low birth weight, gestational age, and preterm birth among African American women residing in the communities of Southeast Queens, New York City compared to European American women residing in Borough of Queens, New York City?

Ho2: There is no association between infant mortality rate and infant characteristics of low birth weight, gestational age, and preterm birth among African American women residing in the communities of Southeast Queens, New York City and European American women in the Borough of Queens, New York City.

$H_1$2: There is an association between infant mortality rate and infant characteristics of low birth weight, gestational age, preterm birth among African American women and European American women residing in the Borough of Queens, New York City.

RQ3: Is there an association between infant mortality and the mother's characteristics of age, marital status, initiation of prenatal care, unhealthy behavior, and community characteristics of education, occupation, and location of birth among African American women residing in the communities of Southeast Queens, New York City and European American women residing in the Borough of Queens, New York City.

Ho3: There is no association between infant mortality rate and the mother's characteristics of age, marital status, initiation of prenatal care, unhealthy behavior, and community characteristics of education, occupation, and location of birth among African

American women residing in the communities of Southeast Queens, New York City and European American women residing in the Borough of Queens, New York City.

$H_1$3: There is an association between infant mortality rate and the mother's characteristics of age, marital status, initiation of prenatal care, unhealthy behavior, and community characteristics of education, occupation, and location of birth among African American women residing in the communities of Southeast Queens, New York City and European American women residing in the Borough of Queens, New York City.

The research hypothesis was that the differences in infant mortality in Queens, New York City communities could be predicted statistically by (a) infant characteristics; (b) mother's characteristics; and (c) community characteristics. The null hypothesis was that the differences in infant mortality in Queens, New York City communities could not be predicted statistically by (a) infant characteristics; (b) mother's characteristics; and (c) community characteristics.

Data Analysis

The first research question: "Is there a difference in the infant mortality rate between the communities of Southeast Queens and the Borough of Queens" was addressed using a *Z* test for the comparison of two population proportions. The *Z* was used to determine if the infant mortality in South East Queens was significantly greater ($p < .05$) than the infant mortality in the Borough of Queens.

The second and third research question "Is there an association in infant mortality in the communities of Southeast Queens, and the Borough of Queens, New York City were addressed by three of the dimensions of the ecological model (Alio, et al., 2010)". The

birth weight and gestational age were summarized using descriptive statistics (mean and standard deviation). Factorial ANOVA was used to determine if the community and ethnicity had significant ($p < .05$) effects on the infant characteristics (birth weight and gestational age). Binary logistic regression was used to determine if the mother's characteristics and the community and social characteristics were statistically significant ($p < .05$) predictors of infant mortality. The stepwise procedure based on the Wald test statistic was used to eliminate predictors with regression coefficients that were not significantly different from zero at $p < .05$. Variables that were found to be not significant predictors of infant mortality ($p > .05$) were excluded from the models.

Spearman's rank correlation analysis was used to determine if there was a statistically significant ($p < .05$) correlation between the annual infant mortality in the Borough of Queens and Southeast Queens communities between each year from 2001 and 2012.

Protection of Participants Rights.

After approval has been granted by the IRB for me to collect data, I requested secondary/archival data from the vital statistic department of the NYCDHMH. IRB number is: 08-29-14-0125655. There was no physical contact with the participants. When making the request for the data, I filed an agreement that specified the conditions for gaining access, the data elements, the explicit purpose of use, and expiration requiring the destruction of the data files. I signed and dated the agreement and returned it to the Vital Statistics Office via e-mail. All of the participant's identifiers were removed from the dataset to protect their confidentiality and anonymity.

The findings of this study may be shared with community leaders, medical professions serving the communities, political representative of the Southeast Queens communities, and public health practitioners. Data that remain with the researcher will be kept for three years on a personal computer that only the researcher can access. Data sharing may be accomplished by publishing the results in an academic journal.

Conclusion

This was a quantitative study that used a correlational research design to compare the infant mortality rate between African American mothers and European American mothers residing in the communities of Southeast Queens and the Borough of Queens, New York City. The Ecological Model was used as the theoretical framework to measure the dependent variables and the independent variables based on data provided by the New York City Department of Health and Mental Hygiene. How the data were collected and analyzed to address the research questions were discussed in this chapter. Chapter 4 will present the results of the study and address the research questions. Chapter 5 will discuss the findings and their significance to the community, public health practitioners and other interest stakeholders. This chapter will also discuss the implications for social changes and if this study can be generalized to communities outside of the study area.

Chapter 4: Results Introduction

The purpose of this study is (a) to compare the perinatal infant mortality rate (IMR) from 2001 to 2012 in Queens, New York City communities (Borough of Queens vs. Southeast, Queens) across the African American (Black Non Hispanic) and the European American (White Non Hispanic) mothers; and (b) to explore the effects of infant characteristics, parent and family characteristics, community characteristics, and historical context on the mortality rates.

Research Questions

The following research questions are addressed:

RQ1: Is there a significant difference in the infant mortality rate among African American (non Hispanic Black) women residing in the communities of Southeast Queens, New York City compared to European American (non Hispanic White) women residing in the Borough of Queens, New York City?

Ho1: There is no significant difference in the infant mortality rate among the African American women residing in the communities of Southeast Queens, New York City compared to European American women residing in the Borough of Queens, New York City.

$H_1$1: There is a significant difference in the infant mortality rate among the African American women residing in the communities of Southeast Queens, New York City compared to European American women residing in the Borough of Queens, New York City.

RQ2: Is there an association between infant mortality rate and infant characteristics of low birth weight, gestational age, and preterm birth among African American women residing in the communities of Southeast Queens, New York City compared to European American women residing in the Borough of Queens, New York City?

$H_0$2: There is no association between infant mortality rate and infant characteristics of low birth weight, gestational age, and preterm birth among African American women residing in the communities of Southeast Queens, New York City compared to European American women residing in the Borough of Queens, New York City.

$H_1$2: There is an association between infant mortality and infant characteristics of low birth weight, gestational age, and preterm birth among African American women residing in the communities of Southeast Queens, New York City compared to European American women residing in the Borough of Queens, New York City.

RQ3: Is there an association between infant mortality and the mother's characteristics of age, marital status, initiation of prenatal care, unhealthy behavior, and community characteristics of education, occupation, and location of birth among African American women residing in the communities of Southeast Queens, New York City compared to European American women residing in the Borough of Queens, New York City.

Ho3: There is no association between infant mortality rate and the mother's characteristics of age, marital status, initiation of prenatal care, unhealthy behavior, and community characteristics of education, occupation, and location of birth among African

American women residing in the communities of Southeast Queens, New York City compared to European American residing in the Borough of Queens, New York City.

$H_1$3: There is an association between infant mortality rate and the mother's characteristics of age, marital status, initiation of prenatal care, unhealthy behavior, and community characteristics of education, occupation, and location of birth among African American women residing in the communities of Southeast Queens, New York City compared to European American women residing in the Borough of Queens, New York City.

Data Collection

The 19 variables defined in Table 1 were used for the statistical analysis. Infant mortality was the dependent variable. The other 18 variables were classified as independent factors, or risk factors for infant mortality.

Table 1

Variables Used in Statistical Analysis

Variable	Units
01 Perinatal Infant Mortality	0 = Alive; 1 = Dead
02 Community	1 = Queens Borough; 2 = South East Queens
03 Mother's Ethnicity	1 = White (Non Hispanic); 2 = Black /African American (Non Hispanic)
04 Year of Infant's Birth	2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012
05 Infant's Birth Weight	Grams
06 Infant's Gestational Age	Weeks
07 Mother's Age	Years
08 Mother's Education	Years
09 Mother's Marital Status	0 = Not Married, 1 = Married
11 Mother's Occupation Status	0 = Housewife, Student, Unemployed, or Retired, 1 = Employed (Business, Industry, Services, etc.)
12 Mother Employed During Pregnancy	0 = No, 1 = Yes
13 Location of Birth	1 = Voluntary Hospital, 2 = Municipal Hospital
14 Prenatal Visit in First Trimester	1 = Yes, 0 = No
15 Medical Risk Factor: Diabetes	1 = Yes, 0 = No
16 Medical Risk Factor: Hypertension	1 = Yes, 0 = No
17 Tobacco Use during Pregnancy	1 = Yes, 0 = No
18 Alcohol Use During Pregnancy	1 = Yes, 0 = No
19Drug Use During Pregnancy	1 = Yes, 0 = No

Participants

The frequency distributions of the participants in Queens are summarized in table 2. The total number of participants was *N* = 9663, of which the majority (n = 8687, 89.9%) lived in Borough of Queens. The two ethnic groups were almost equally divided between Black/African American (non Hispanic) mothers and their infants *(n* = 4080, 47.0%) and White/European American (non Hispanic) mothers and their infants (*n* = 4607, 53.0%) in the Borough of Queens. In contrast, the participants in Southeast Queens were dominated by Black/African American (non Hispanic) mothers and their infants (*n* = 884, 90.6%).

Table 2
Participants

Location	Black/African American (non Hispanic)		White/European American (non Hispanic)		Total	
	N	%	*n*	%	n	%
Queens Borough	4080	47.0%	4607	53.0%	8687	89.9%
Southeast Queens	884	90.6%	92	9.4%	976	10.1%

Research Questions Analysis

The following five sections present the evidence to address the research questions.

Perinatal Infant Mortality Rate

This section addresses RQ1: Is there a difference in infant mortality between the New York communities of the Borough of Queens and South East Queens communities? Table 3 presents the results of a *Z* test for the comparison of two population proportions,

indicating that the infant mortality (IM) in South East Queens(4.20%) between 2001 and 2012 was significantly greater ($p < .001$) than the IM in Borough of Queens(1.56 %).

Table 3

Z test for Comparison of IM between Borough of Queens and Southeast Queens

Community	IM (%)	*Z*	*p*
Queens Borough	1.56	-4.02	<.001*
Southeast Queens	4.20		

Note: * Significant difference between communities (p < .001)

Table 4 presents the results of a *Z* test indicating that the IM for Black mothers in Queens Borough (2.96 %) was significantly greater ($p < .001$) than the IMR for White mothers in Queens Borough (0.33 %) between 2001 and 2012.

Table 4

Z test for Comparison of IM between White and Black Ethnic Groups in Queens Borough

Ethnic Group	IM (%)	*Z*	*p*
White	0.33	-9.48	<.001*
Black	2.96		

Note: Significant difference between groups ($p < .001$)

Table 5 presents the results of a *Z* test indicating that the IM for Black mothers in Southeast Queens (4.52 %) was significantly greater ($p < .01$) than the IM for White mothers in Southeast Queens (1.08 %).

Table 6 presents the results of a Z test indicating that the IM for Black mothers (3.24 %) in Queens was significantly greater (p < .001) than the IM for White mothers (0.34 %)

Table 5

Z test for Comparison of IM between White and Black Ethnic Groups in Southeast Queens

Ethnic Group	IM (‰)	*Z*	*p*
White	1.08	-2.67	.008*
Black	4.52		

Note: Significant difference between groups ($p < .01$)

Table 6

Z test for Comparison of IM between White and Black Ethnic Groups

Ethnic Group	IM (‰)	Z	p
White	0.34	-10.94	<.001*
Black	3.24		

Note: Significant difference between groups ($p < .001$)

Determinants of Perinatal Infant Mortality Rate

The following four sections address RQ2: Can the association between infant mortality in Queens, New York City communities be determined by (a) infant characteristics; (b) parent and family characteristics; and (c) community characteristics.

Infant Characteristics

Table 7 compares the infant characteristics (birth weight and gestational age) by community (Borough of Queens vs. Southeast Queens) and ethnicity (White vs. Black). Table 8 presents the results of factorial ANOVA, to determine the effects of community and ethnicity on infant's birth weight. Table 9 presents the results of factorial ANOVA, to determine the effects of community and ethnicity on gestational age

Table 7

Infant Characteristics Classified by Community and Ethnicity

Variable	Queens Borough				Southeast Queens			
	White		Black		White		Black	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Infant's Birth Weight (grams)	3338.38	38.35	3131.64	38.43	3238.70	38.76	3176.93	38.55
Infant's Gestational Age (weeks)	38.85	2.22	38.43	38.76	1.97	2.22	38.55	2.66

Table 8

Factorial ANOVA: Effects of Community and Ethnicity on Infant's Birth Weight

Variable	df	F	p
Community	1	1.96	.161
Ethnicity	1	255.48	<.001*

Note: * Significant effect ($p < .001$

Table 9

Factorial ANOVA: Effects of Community and Ethnicity on Infant's Gestational Age

Variable	df	F	p
Community	1	1.21	.271
Ethnicity	1	63.06	<.001*

The results of factorial ANOVA indicated that the effect of the community (i.e., living in Queens Borough vs. Southeast Queens) was not significant ($p > .05$) with respect to the Infant's Birth Weight or Gestational Age. The ethnicity of the mother, however, had a significant effect. Across the two communities, the infant's birth weight of the Black

mothers *(M* = 3139.43, S*D* = 619.28) was significantly lower (*F*, 1, 9660) = 255.48, *p* < .001) than among the White mothers (*M* = 3336.43, S*D* = 573.06). The infant's gestational age of the Black mothers (*M* = 38.45, SD = 2.72) was also significantly lower (*F*, 1, 9660) = 63.06, *p* < .001) than among the White mothers (*M* = 38.85, *SD* = 2.21).

An explanation for the significant difference in birth weight between the Black and White mothers was the higher proportion of LBW infants among the Black mothers. The frequency distribution histogram in Figure 4 illustrates that 6.78% of the birth weights of the infants of the White mothers were low (< 2500 g) whilst 0.99% of the birth weights were very low (< 1500 g).

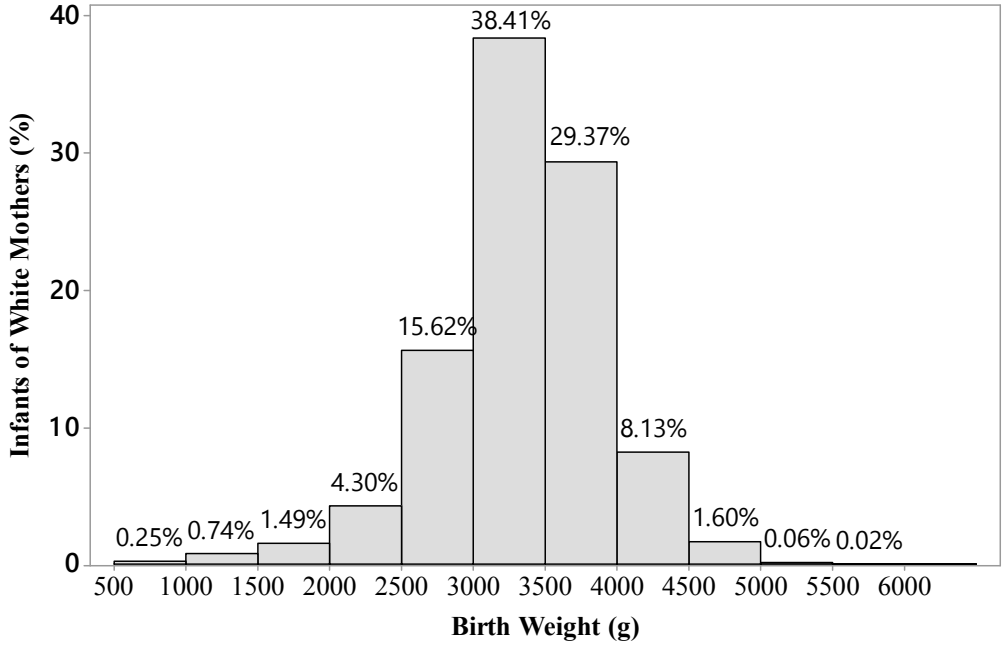

Figure 4. Frequency distribution histogram of birth weights of infants of White mothers

The histogram in Figure 5 illustrates that the proportion of infants of Black mothers with low birth weights (< 2500 g) was higher (11.84%) whilst the proportion of very low birth weight infants (< 1500 g) was over twice that of the White mothers (2.06%).

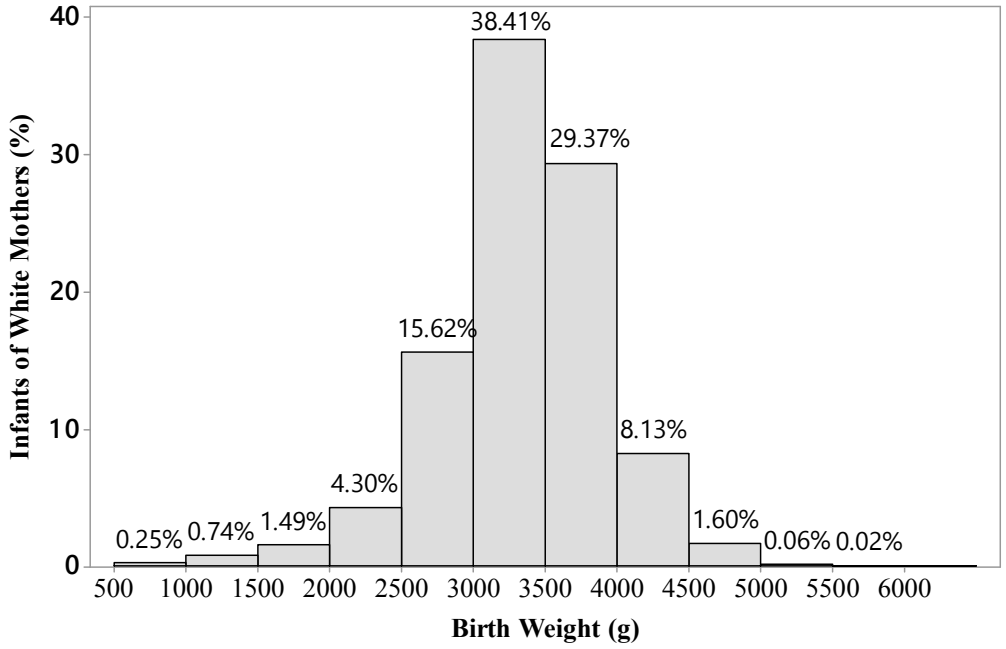

Figure 4. Frequency distribution histogram of birth weights of infants of White mothers

The histogram in Figure 5 illustrates that the proportion of infants of Black mothers with low birth weights (< 2500 g) was higher (11.84%) whilst the proportion of very low birth weight infants (< 1500 g) was over twice that of the White mothers (2.06%).

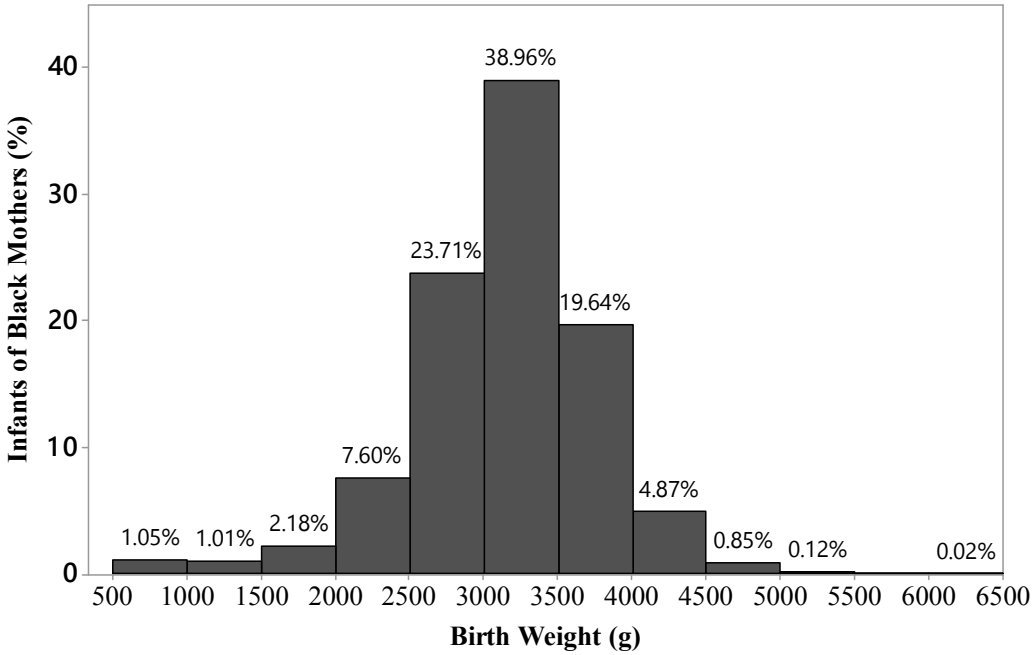

Figure 4. Frequency distribution histogram of birth weights of infants of Black mothers

An explanation for the significant difference in gestational age between the Black and White mothers was the higher proportion of premature births among the infants of the Black mothers. The frequency distribution histogram in Figure 5 illustrates that 6.12% of the gestational ages the infants of the White mothers were < 36 weeks. The frequency distribution histogram in Figure 6 illustrates that a higher proportion (10.09%) of the gestational ages of the infants of the Black mothers were < 36 weeks.

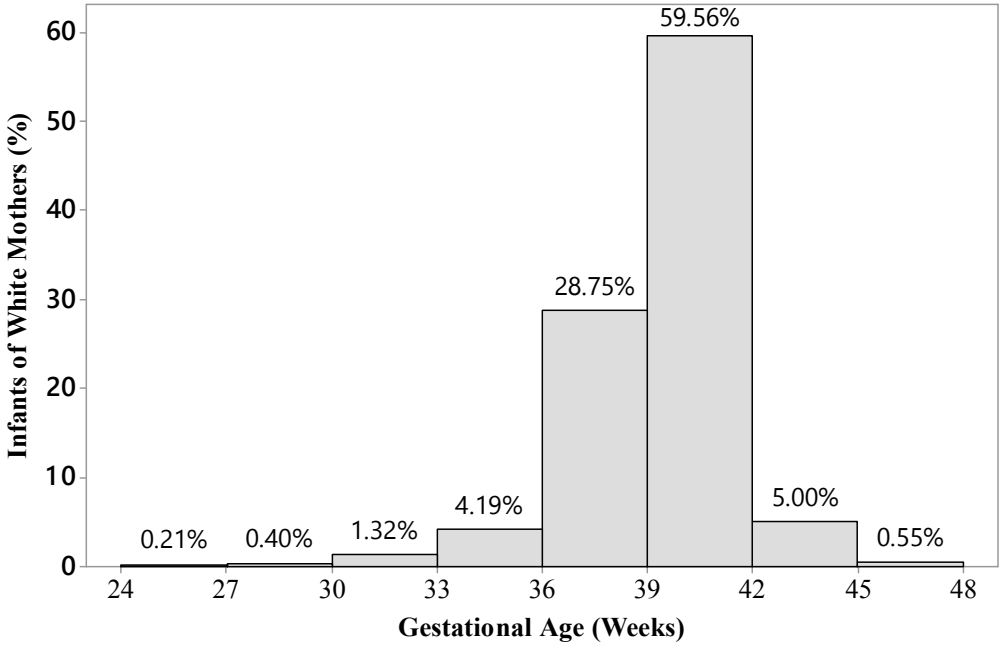

Figure 5. Frequency distribution histogram of gestational ages of infants of White mothers

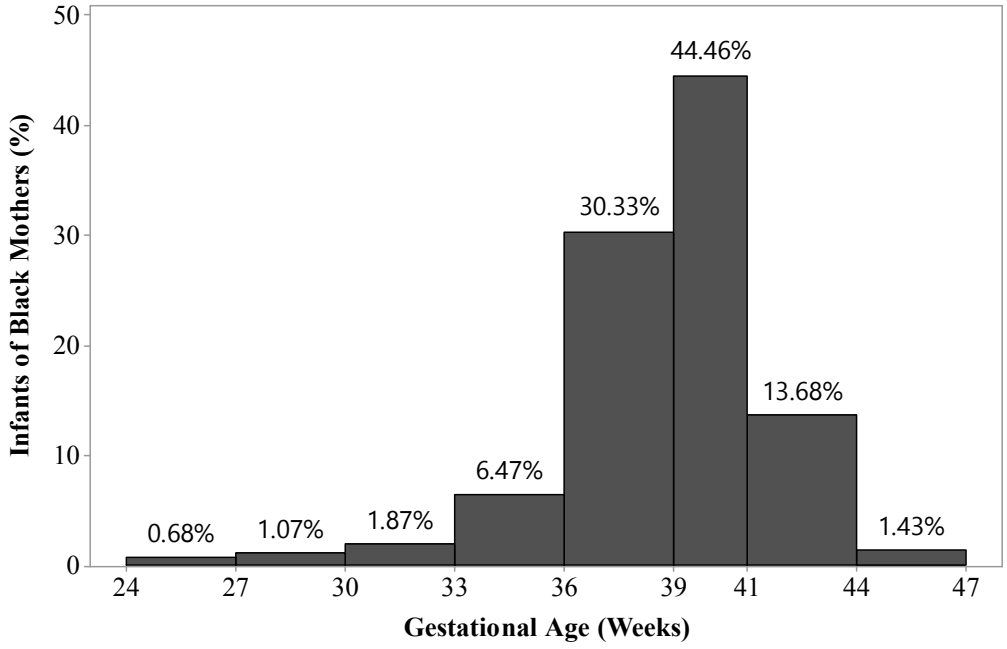

Figure 6. Frequency distribution histogram of gestational ages of infants of Black mothers

Mother's Characteristics.

Can the association in IM in Queens, New York City communities be determined by the mother's characteristics? Table 10 presents the mother's characteristics classified by community and ethnicity.

Table 10

Mother's Characteristics Classified by Community and Ethnicity

Variable	Category	Queens Borough				Southeast Queens			
		White		Black		White		Black	
		n	%	*n*	%	*n*	%	*n*	%
Mother's Age	< 35 years	3465	39.9	3336	38.4	71	7.3	682	69.9
	≥ 35 years	1142	13.1	744	8.6	21	2.2	202	20.7
Mother's Marital Status	Not Married	813	9.4	2578	29.7	19	1.9	516	52.9
	Married	3794	43.7	1502	17.3	73	7.5	368	37.7
Prenatal Visit in First Trimester	No	982	11.3	1608	18.5	14	1.4	313	32.1
	Yes	3625	41.7	2472	28.5	78	8.0	571	58.5
Diabetes	No	4383	50.5	3897	44.9	87	8.9	841	86.2
	Yes	224	2.6	183	2.1	5	0.5	43	4.4
Hypertension	No	4484	51.6	3891	44.8	79	8.1	845	86.6
	Yes	123	1.4	189	2.2	13	1.3	39	4.0
Tobacco Use	No	4465	51.6	3953	45.7	85	8.8	859	89.1
	Yes	140	1.6	95	1.1	7	0.7	13	1.3
Alcohol Use	No	4603	53.2	4040	46.7	92	9.5	871	90.4
	Yes	2	0.02	8	0.1	0	0.0	1	0.1
Drug Use	No	4586	52.8	4032	46.4	91	9.3	879	90.1
	Yes	21	0.2	48	0.6	1	0.1	5	0.5

The most frequent mother's age was < 35 years among the White Mothers at Queens Borough (*n* = 3465, 39.9%) and also among the Black Mothers Southeast Queens (*n* = 682, 69.9%). In Queens Borough, the most frequent marital status was married among the White mothers (*n* = 3794, 43.7%) whereas in Southeast Queens, the most

frequent marital status of the mothers was not married among the Black mothers (*n* = 516, 52.9%). The number of prenatal visits is most frequent among the White mothers in Queens Borough (*n* = 3438, 75.0%). The Black mothers in Southeast Queens had a higher proportion of prenatal visits in the first trimester (*n* = 57.1, 58.5%) than the Black mothers in Queens Borough (*n* = 2472, 28.5%). Diabetes was most prevalent among the Black mothers in Southeast Queens (*n* = 43, 4.4%). Hypertension was also most prevalent among the Black mothers in Southeast Queens (*n* = 39, 4.0%). The frequency of use of tobacco was highest among White mothers in Queens Borough (*n* = 140, 1.6%). Use of alcohol was highest among the Black mothers in Queens Borough (*n* = 8, 0.1 %) and the Black mothers in Southeast Queens (*n* = 1, 0.1%). Black mothers are also the most frequent users of drugs, in Queens Borough (n = 48, 0.6%) and in Southeast Queens (*n* = 5, 0.5%).

Table 11 presents a binary logistic regression model to predict infant mortality (1 = dead vs. 0 = alive) using the mother's characteristics as the predictors. The stepwise procedure based on the Wald test statistic is used to eliminate predictors with regression coefficients that are not significantly different from zero at $p < .05$. Five risk factors (mother's age, diabetes, hypertension, alcohol use, and drug use) were found to be not significant predictors of infant mortality ($p > .05$). The odds ratios indicated that (a) Black mothers were 7.48 more likely to have infant mortality than White Mothers; (b) Married women were 0.66 less likely to have infant mortality than unmarried women; (c) Mothers who made a prenatal visit in the 1st trimester are 0.59 times less likely to have infant mortality than those who did not; (d) Mothers who smoked tobacco are 2.65 times more like to have infant mortality than mothers who did not smoke.

Table 11

Binary Logistic Regression Model to Predict Infant Mortality by Mother's Characteristics

Predictor	Regression Coefficient	Wald Statistic	df	p	Odds Ratio	95% CI	
						Lower	Upper
Ethnicity	2.01	47.85	1	<.001*	7.48	4.23	13.24
Marital Status	-0.42	4.81	1	.028*	0.66	0.45	0.96
Prenatal Visit in 1st Trimester	-0.53	8.02	1	.005*	0.59	0.41	0.85
Tobacco Use	0.98	6.36	1	.012*	2.65	1.24	5.65

Note: * Significant predictor of Infant Mortality ($p < .05$).

Community Characteristics

Can the association in IM in Queens, New York City communities be determined by community characteristics? Table 12 presents the community s characteristics classified by community and ethnicity. The highest levels of education are among the White women in Queens Borough (n = 3310, 38.1%) and Black women in Southeast Queens (n = 511, 52.4%). White mothers are most frequently employed in Queens Borough, (n = 2898, 33.4%) whereas in Southeast Queens, Black mothers are most frequently employed (n = 543, 55.6%). Black mothers in Southeast Queens are also the most frequently employed during their pregnancy (n = 480, 49.2%). Voluntary hospitals are the most frequent locations of birth of the infants of the White mothers in Queens Borough (n = 4342, 50.0%) as well as the infants of the Black mothers in Southeast Queens (n = 693, 71.0%).

Table 12

Community Characteristics Classified by Community and Ethnicity

Variable	Category	Queens Borough				Southeast Queens			
		White		Black		White		Black	
		n	%	*n*	%	*n*	%	*n*	%
Education	≤ 12 years	1297	14.9	2230	25.7	28	2.9	373	38.2
	> 12 years	3310	38.1	1850	21.3	64	6.6	511	52.4
Occupation	Housewife	1278	14.7	1074	12.4	29	3.0	206	21.1
	Student	179	2.1	386	4.4	2	0.2	74	7.6
	Unemployed	244	2.8	520	6.0	3	0.3	61	6.2
	Employed	2898	33.4	2098	24.2	58	5.9	543	55.6
Employed during Pregnancy	No	2036	23.5	2251	25.9	40	4.1	404	41.4
	Yes	2564	29.5	1828	21.1	52	5.3	480	49.2
Location of Birth	Voluntary Hospital	4342	50.0	3310	38.1	88	9.0	693	71.0
	Municipal Hospital	247	2.8	766	8.8	3	0.3	0	0.0
	Home	18	0.2	4	0.09	1	0.1	0	0.0

Table 13 presents a binary logistic regression model to predict infant mortality using the community characteristics as the predictors. The stepwise procedure eliminated three factors (education, occupation, location of birth) that were not predictors at the .05 level of significance. The odds ratios indicated that (a) mothers who were employed during pregnancy were 0.27 times less likely to have infant mortality than mothers who were not so employed; and (b) women with more years of education were 0.89 less likely to have infant mortality than women with less years of education.

Table 13

Binary Logistic Regression Model to Predict Infant Mortality by Community Characteristics

Predictor	Regression Coefficient	Wald Statistic	df	p	Odds Ratio	95% C.I	
						Lower	Upper
Employed During Pregnancy	-1.31	42.19	1	<.001*	0.27	0.18	0.40
Education (Years)	-0.11	16.99	1	<.001 *	0.89	0.85	0.95

Note: * Significant predictor of Infant Mortality ($p < .001$).

Historical Context

This section addresses the extent the IM in Queens, New York City communities can be determined by historical context (between 2001 and 2012)? Table 14 summarizes the IM in Borough of Queens and Southeast Queens from 2001 to 2012.

Table 14

	Southeast Queens	Queens Borough
Year	IM (‰)	IM (‰)
2001	8.75	1.43
2002	6.02	0.90
2003	4.94	2.01
2004	1.27	2.34
2005	4.60	0.97
2006	4.35	2.53
2007	0.00	1.29
2008	4.71	1.38
2009	3.66	1.72
2010	2.30	0.43
2011	2.67	1.73
2012	7.41	2.01

Annual Variation of IM in Borough of Queens and Southeast Queens

A non-parametric correlation analysis was conducted to determine if the IM in Southeast Queens between 2001 and 2012 is correlated with the IM in Queens Borough. The results are not statistically significant (Spearman's rank correlation coefficient (N, 12) = .028, p = .931).

Summary

Sufficient statistical evidence was provided to conclude that:

1. There was a significant difference in IM between the New York communities of Queens Borough and Southeast Queens.

2. The differences in IM in Queens, New York City communities were significantly determined by infant characteristics, specifically birth weight and gestational age.

3. The differences in IM in Queens, New York City communities were significantly determined by the mother's characteristics, specifically ethnicity, marital status, prenatal visit in 1st semester, and use of tobacco.

4. The differences in IM in Queens, New York City communities were significantly determined by community characteristics, specifically employment during pregnancy and years of education.

5. The IM in Queens, New York City communities did not appear to be determined by historical contexts because there was no significant correlation between the IM in Southeast Queens between 2001 and 2012 and the IM in Queens Borough during the same time period.

Chapter 5 Interpretation and Recommendations

The purpose of this quantitative study is to explore, using a correlational research design, the possible reasons for the higher infant mortality experienced by Black/African American (non Hispanic) mothers in South East Queens New York City compared to White European (non Hispanic) mothers in Queens Borough, New York City. The study population consisted of all Black (non Hispanic) and White (non Hispanic) mothers in the Southeast Queens and Queens Borough communities and their infants born between 2001 and 2012 inclusive.

This chapter presents a discussion of the results in seven sections: (a) Summary of the study; (b) Interpretation of the findings; (b) Implications for social change; (c) Recommendations for policy makers; (d) Recommendations for action; (e) Recommendations for future research; and (f) Conclusions

Summary of the Study

The total number of participants in the study was $N = 9663$, of which the majority lived in Queens Borough. The two ethnic groups were almost equally divided between Black/African American (non Hispanic) mothers and their infants and White/European American (non Hispanic) mothers and their infants in Queens Borough. In contrast, the participants in Southeast Queens are dominated by Black/African American (non Hispanic) mothers and their infants.

The analysis of data provided by the New York Health Department is underpinned by the ecological model developed by Alio et al. (2010) to explain the differences in infant mortality between Black and White ethnic groups. The ecological

model classifies two levels of determinants of infant mortality, the inner-most and outer-most. The inner-most level comprises infant characteristics, parental characteristics, and community and society characteristics that may have an influence on disparities in infant mortality. The outer-most level is the historical context.

Overall, the findings of this study supported the research hypothesis that the differences in infant mortality in Queens, New York City communities could be predicted statistically by use of (a) infant characteristics; (b) mother's characteristics; (c) community characteristics. The historical context, including the evolution of racial discrimination, could not, however, be explained to determine the disparity gap in infant mortality.

Interpretation of the Findings

The two infant characteristics that were found to be determinants of the higher level of infant mortality of Black/African American women in Southeast Queens vs. White/European American women in Queens Borough were (a) the Southeast Queens infants had a lower mean birth weight, and a higher proportion of infants with a low birth weight (LBW< 2500 g); and (b) the Southeast Queens infants had a lower mean gestational age, and a higher proportion of preterm infants (PTB < 36 weeks). These findings were consistent with considerable historical evidence in the literature to indicate that (a) LBW is a major causes of the disparity gap in mortality between Black and White infants in the United States and elsewhere (Alexander et al., 2003; 2008; Byrd, 2007; Branun, 2002; CDC, 2004; Child Health USA (2014); Hamilton et al, 2010; Kitsantas & Gaffney, 2010; Matthews & Keppel, 2005; Matthews & MacDorman, 2010; Owusu-Ansah & David, 2008; Schempf et al., 2007); and that (b) the risk of infant mortality increases significantly

with decreasing gestational age (Alexander et al., 2003; Dunlop et al., 2011; Matthews & MacDorman , 2010; National Center for Health Statistics, 2014).

Three maternal characteristics are found to be risk factors for infant mortality are (a) being unmarried; (b) use of tobacco; and (c) not starting prenatal visits in the first semester. The identification of marital status as a determinant of infant mortality is consistent with the findings of other researchers (Balayla et al., 2011; Lhila & Long, 2012). The relationship between use of tobacco during pregnancy, low birth weight, and infant mortality has already been previously identified by other researchers (Azimi & Lofti, 2013; Lobel et al., 2008; Salihu et al., 2013; Wikström et al., 2010). Perhaps the most important maternal characteristic is the timing of prenatal care, which has been reported by many researchers to elevate the risk infant mortality (Cox et al. 2011; Figueiredo et al., 2012; Kitsantis & Gaffany, 2010; Kramer & Hogue, 2009; Lhila & Long, 2012; Wilkinson et al., 2011).

Two community characteristics, specifically the low level of education of the mothers, and their need to be employed (during pregnancy) are found to be risk factors for infant mortality in this study. Both of these characteristics reflect the low level of the socioeconomic status of the mothers. Other researchers have also identified socioeconomic status as an important risk factor to explain the disparity gap. (Duckett & Artiga, 2013; Elder et al., 2013; Haider, 2014)

The infant mortality in Queens, New York City communities did not appear to be determined by joint historical contexts (e.g. the development of racial discrimination in the two communities) because there was no significant correlation between the annual

infant mortality in Southeast Queens between 2001 and 2012 and the annual infant mortality in Queens Borough during the same time period. The implications are that the historical factors that are associated with the annual variations in infant mortality in Southeast Queens between 2001 and 2012 are probably different to the historical factors that are associated with the yearly variations in IM in Queens Borough.

Implications for Social Change

To achieve the goal of social justice, theoretical models need to be applied in reality to reduce infant mortality by identifying and targeting the groups of people that are at the highest risk (Besculides & Laraque, 2005; Burns, 2005; Peck at al, 2010). The empirical evidence needs to be translated, to support professional practice, in order to ensure that new knowledge and skills reach the individuals and communities for which the research is originally intended (Woolf, 2009). The implications for social change therefore involve the social manipulation of the evidence-based factors revealed in the current study that appear to explain why there is a disparity gap in infant mortality between the Black/African American and the White/European American mothers in Queens, New York City communities.

The current study applied the ecological model (Alio, et al., 2010) to identify the following risk factors. The differences in infant mortality in Queens, New York City communities are significantly determined by (a) infant characteristics, specifically birth weight and gestational age; (b) maternal factors, specifically ethnicity, marital status, prenatal visit in the first semester, and use of tobacco; (c) community and social

characteristics, specifically employment during pregnancy and education. Action is needed to target these factors.

Implications for Policy Makers

Policies with the goal of achieving social change, by reducing or eliminating the significantly higher proportions of LBW, PTB, and IM among Black mothers in South East Queens, should involve targeting resources to specified groups of mothers. These policies should include: (a) supporting unmarried Black mothers to better cope with their pregnancies; (b) advising Black mothers to start prenatal visits in the first semester; (c) recommending all Black mothers to stop smoking tobacco during pregnancy; (d) recommending Black mothers not to work during pregnancy; and (c) improving the education of Black mothers to ensure that they understand the implications of their behaviors during pregnancy.

Recommendations for Action

The recommendation for action is to implement a new evidence-based health promotion project in Southeast Queens. The purpose of a health promotion project is to assist individuals and communities to acquire and develop the essential knowledge and skills that they require to adopt beneficial health behaviors and to encourage healthy lifestyles (Healey & Zimmerman, 2010). The requisites of an evidence-based health promotion project include (a) a specific target population; (b) empirical evidence to support the implementation of the project; (b) specific, measurable goals; (c) a well-defined program design and time-frame, and (d) a built-in evaluation process to measure program quality and health outcomes (Inman, Van Bakerqem, Larosa, & Garr, 2011).

The target population for the proposed health promotion project consists of Black women in the Southeast Queens community. The evidence for the implementation of this program is derived from the current study, which identified several risk factors associated with high infant mortality. The goals are to produce measurable reductions in the infant mortality among the target population. A Plan-Do-Study-Act (PDSA) cycle which incorporates a built-in evaluation process should is considered to be the best framework to implement the proposed health promotion program (Healey & Zimmerman, 2010). .

A specific intervention with the goal of reducing the high infant mortality of Black women in Southeast Queens is designed during the Plan stage. Planning the intervention requires a coordinated approach based on the recommendations of a designated health promotion group consisting of all the stakeholders. This group should consist of researchers, public health practitioners, community leaders, and other interested partners to ascertain the most appropriate intervention that is best for the community, specifically an intervention that will cause a downward trend in infant mortality and help to eliminate the disparity gap.

The health belief model (Glanz & Bishop, 2010) should be used as the theoretical framework to design the intervention during the Plan stage of the PDSA cycle. The health belief model posits that (a) if a person seriously believes that a certain type of behaviour is likely to cause disease, then there is an increased likelihood of that person taking remedial action to reduce the risk of disease associated with that behavior; and (b) health promotion projects are most likely to achieve optimal behavior changes if they

successfully target the people who are most like to reap the benefits (Jones, Jensen, Scherr, Brown, Christy, et al. 2015).

The social support theory should also be used to underpin the design of the intervention at the Plan stage of the PDSA cycle. The social support theory posits that changes in human behavior are the consequence of relationships between the environment, inter-personal factors, and the behaviour itself. The practical application of the social support theory is that new patterns of behaviour, specifically improvements in physical health, are reinforced if a person has assistance available, and especially if the person is integrated into a formal social network (Uchino, 2004).

In the Do phase, the intervention should be executed for a short trial period (e.g., one year). A trial period is recommended because less time, money, and effort is involved if an evidence-based project with the goal of improving the performance of individuals or a community is executed initially on small scale before it is implemented more widely (Langley, Norman, & Provost, 2009). In the Do phase, the intervention team should endeavor to assist the personal attempts of the participants (i.e., the Black pregnant women in Queens Southeast) to adopt self-efficacious behaviors, including (a) reducing the stress levels associated with pregnancy; (b) starting prenatal visits in the first semester; (c) stop smoking tobacco; (d) not working during pregnancy; and (c) education to ensure the deleterious implications of unhealthy behaviors during pregnancy are well understood.

In the Study stage of the PDSA cycle, the intervention team should measure and analyze the behaviors of each participant before and after the intervention. The data are

analyzed to determine if significant reductions in risk factors for high infant mortality have taken place as a consequence of the intervention. In the Act phase of the PDSA cycle, the intervention team evaluates the findings of the Study Phase, and determines if the intervention has been effective. If a significant reduction in risk factors (e.g., LBW, PTB) and IM occurs among the participants as a result of the intervention, then the intervention may be continued. If not, then the intervention needs to be changed, and the PDSA cycle continued until it is found that the target population responds more positively to the intervention in terms of a significant reduction in LBW, PTB.

Recommendations for Future Research

Most of the information included in the literature review, as well as the findings of the current study, is based on the use of quantitative research designs. Quantitative research designs are valuable to measure variables that can be used to examine, describe, and summarize the population from which a sample was drawn. Quantitative research designs, however, cannot explain in rich detail how and why each member of a population behaves differently in the way that people often do (Creswell, 2014). A qualitative research design should therefore be used to answer difficult research questions to explain why the Black women in Southeast Queens behave in the way that is revealed by the current study.

Some examples of questions that have not yet been answered are: “Why do unmarried mothers have a higher risk of infant mortality than married mothers?” “Why do some mothers smoke during pregnancy? Why do some mothers work during pregnancy? Why do some mothers not attend a prenatal visit in the first semester? The

future recommended research, using a qualitative design, is therefore to interview a group of Black mothers in Queens, New York City. The research design should be hermeneutic phenomenology, meaning that the researcher attempts to extract the essence of the lived experiences of the participants (Creswell, 2014). Phenomenology has been underutilized in medical research, even though this approach may often provide a deeper insight than quantitative methods into the perceptions and behaviors of patients (Carel, 2011, 2012). A thematic analysis of the interview transcripts should be performed, to extract emergent themes that may explain why certain of the mothers in Queens, New York City, display unhealthy behaviors, that are risk factors for high infant mortality, whereas other participants do not (Tonon, 2015).

Conclusions

The findings of this study are consistent with the view of several researchers that the disparity gap between infant mortality among different ethnic groups is predictable by a combination of covariates (e.g., single parenthood, poor education, occupation, inadequate prenatal care). Collectively, these maternal, community, and society characteristics are strongly related to socio-economic status (Duckett & Artiga, 2013; Elder et al., 2013; Haider, 2014). Consequently, it is probable that the low level of socioeconomic status of Black African mothers in Southeast Queens tends to be the overall determinant of higher infant mortality.

To achieve social justice the findings of the current study need to be applied in practice to help close the disparity gaps by reducing infant mortality rates in Southeast Queens. This study identified the groups of mothers that are at the highest risk.

Interventions to achieve social change, by reducing or eliminating the significantly higher proportions of LBW, PTB, and IM in South East Queens, should involve targeting resources specifically to these groups. Resources should be targeted to: (a) support unmarried Black mothers to better cope with their pregnancies; (b) advise all Black mothers to start prenatal visits in the first semester; (c) recommend all Black mothers to stop smoking tobacco during pregnancy; (d) recommend Black mothers not to work during pregnancy; and (c) improve the education of all Black mothers to ensure that they understand the implications of their behaviors during pregnancy. A health promotion project, based on the implementation of a PDSA cycle, is recommended action to implement and evaluate this intervention.

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