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Mortality Disparities Among Puerto Rican Infants in 2015

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Walden University
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Abstract

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MSN, Universidad Ana G. Méndez, 2019

MBA, HCA, University of Phoenix, 2006

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Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Public Health

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Abstract

There is a well-established disparity between infant mortality rates among women residing in rural areas in Puerto Rico in comparison with woman residing in urbans areas of Puerto Rico. There is a significant amount of research that connects infant mortality to low birth weight, congenital malformations, and premature births. The purpose of this study was to determine infant mortality and its relationship with the geographical location of Puerto Rican mothers. The study also examined whether there is a relationship between infant mortality and the area of residence (rural/urban) of the mother, marital status, race, and education level of the mother. A quantitative cross-sectional design was used. Cases were sampled from the Linked Birth/Infant Death data file available for the year 2015 from the National Center of Health Statistics. Roy's adaptation model framework was employed. Analyses included logistic regression and multinomial logistic regression models using the indirect variables (age, race, marital status, prenatal care, and place of birth of Puerto Rican women residing in rural areas of Puerto Rico). The research suggested a relationship between the socioeconomic level and mother's residence with a high rate of infant mortality in Puerto Rico. In Puerto Rico, low birth weight (*OR* .386) was the main predictor of infant mortality. Between the zone residences, there were significance differences ($p< 0.05$) in the *OR* related to before preterm birth. The implications for positive social change include the possible use of results by Public Health professionals to promote awareness of the risk factors and prevention of infant mortality.

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Dedication

This study is dedicated first to God and, to my five grandchildren, Alondra Karolina Roman Bizaldi, Kamila Sofia Bizaldi Concepcion, Bryan Jahir Bizaldi Concepcion, Mykaela Sofia Bizaldi Concepccion and Rene Osvaldo Roman Bizaldi.

Acknowledgments

I recognize my husband, Osvaldo Bizaldi, my son, Bryan, and daughter Thania Bizaldi, my mom, Carmen, and my sisters, Dolores and Zoraida, for your consideration, support, and patience with me all these years. Finally, I recognize my Chair, Dr. Raymond Panas, and second committee member Dr. Heba Tawfik, for your honesty, teaching, and patience during this journey. I acknowledge you all. A thousand thanks and blessings.

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Chapter 1: Introduction of Study

Introduction

There are two important aspects in the investigation of infant mortality (IM) in Puerto Rico (PR). The demographic variables reflecting the disparities in children and maternal health deserve special consideration. Research has gone beyond individual maternal and child factors that are responsible for differential birth outcomes to incorporate community and contextual influences. The availability of data and the increase in collaborative efforts of demographic research public health research, and geographic research make the analysis of data on infant death possible and allow the analysis at multiple levels. This has produced greater interest in studying the effects of social and demographic characteristics on child health and survival.

The other important aspect of this research is the growing ability of researchers to examine birth outcomes beyond IM from any cause, such as infant death from specific causes, prematurity, and low birth weight. The increased availability of data on IM due to specific causes has allowed researchers to examine trends in child health and to group some causes of death according to the etiology. The development of more research has contributed significantly to data on inequalities in child health and has brought a greater awareness of the factors that influence children's health, generating an important interest for health policies and programs, such as the 2010 Centers for Disease Control and Prevention (CDC) Healthy People Goals (CDC, 2016).

Historically, these two areas of health inequality research have remained distinct and separate from each other. This has been due in large part to statistical, data and methodological limitations. Multilevel models do not only require large data sets but also

the examination of results, such as mortality by specific cause, and require many more cases than investigations on causes of infant death. Often, this means that data at the national level or state-level data aggregated and grouped over several years are required to achieve statistical significance and reliable results.

Background

According to the World Health Organization (WHO, 2016), the IM rate is universally considered one of the indicators of health status. Given that most deaths in children under 1 year of age are preventable, it is considered an indicator that measures the quality of life, well-being of a country, and level of social development (WHO, 2016). The IM rate reflects the probability of dying between birth and before reaching 1 year of age. This indicator is expressed for every 1,000 live births. In the last 40 years in PR, these infant deaths have been reduced annually. In the last decade, there has been a decrease from 607 in 2000 to 348 in 2010, which represents a reduction of 42.7% (Khan, 2013).

The most recent data report shows that the IM rates in PR from 1970 to 2010 have shown a downward pattern. The IM rate in PR dropped from 28.6% in 1970 to 8.8% in 2008, which represented a net decrease of approximately 19.8%. During the 2004 to 2013 period, the number of child deaths decreased from 425 children in 2004 to 270 children in 2013 or 155 fewer child deaths. As for the IM rate, during this period, there was a decrease from 8.1% to 7.4% for every 1,000 live births. In general, from 2005 to 2009 there was a decrease in the IM rate, being the lowest rate in 2009 (8.0 infant deaths per 1,000 births). As of 2009 the IM rate, increased steadily until reaching 9.5 infant deaths per 1,000 live births in 2012. By 2013, the IM rate decreased to 7.4 infant deaths per

1,000 live births (Health Department, Demographic Register and Vital Statistic of San Juan, PR, 2015). The main causes of IM in PR are congenital malformations, chromosomal abnormalities, intrauterine hypoxia, asphyxia at birth, newborn sepsis, and low birth weight (Khan, 2013). Many of these disorders are related to short gestation and malnutrition. One of the most vulnerable groups are infants between 0 and 12 months of age, including newborns (0- 28 days) and post newborns (29 days to 12 months). Low birth weight and preterm birth are two of the frequently cited causes of high IM among Puerto Rican Woman Mathews and MacDorman, (2013). The risk of a child dying before completing the first year of age was higher in P R (4.23%), even when compared to neonatal death with Cuba (2.28%; National Vital Statistic Report, 2018; WHO, 2016).

Additional risk factors directly associated with IM disparities were examined by Reddy et al. (2009), who studied gestational age and birth weight as risk factors for infant death. These causes were mentioned by Mathews and MacDorman (2013) although Hispanics exhibit a lower IM rate than the general rate of the United States. According to Mathews and MacDorman (2013), Puerto Ricans exhibited an IM rate of 4.47 per 1,000 live births, the lowest mortality rate among Hispanic subgroups. MacDorman (2011) and MacDorman and Mathews (2009) were among the few researchers who published descriptive data on infant deaths by Hispanic subgroups.

It is often assumed that countries with higher rates of IM are less advanced in terms of medical technology and general levels of modernization and development than populations with lower IM rates. With advances in technology and medicine, many babies who would never have had the opportunity to survive in earlier decades can now arrive on time and be born with minimal complications. However, despite these

advances, the IM rate in PR remains high, especially when compared with IM y rates of other countries such as Cuba, which has less technological resources and is a minimally developed territory.

Problem Statement

In this study, I examine by this study was the disparity of IM in PR. I sought to address the relationship between maternal age, marital status, race, and education levels with IM among Puerto Rican infants between 0 and 2 months of age, including newborns (0 – 28 days) and post newborns (29 days to 12 months) through linked births and infant death from January 2015 to December 2015. Another important point to address is the lack of studies aimed at Puerto Rican women who live in different regions of PR. Several published studies have indicated that health disparities exist in maternal care in PR, but researchers have not identified the specific risk factors associated with IM among Puerto Rican women (Landale, 2006). Health disparities arise from differences in access to and use of the formal health care system, and influences of cultural and materialistic type affecting IM. The gap in these studies that are predominant to Hispanic-Americans are, for example, missing data about the father and maternal marital status recoding such as married, not married, or unknown and does not include cohabiting or separated, distinctions that could be important to infants' health status (Mathews & MacDorman, 2013). Most of the demographic and public health research on infant health has documented lower risks of poor pregnancy outcomes for married women than for their nonmarried counterparts (MacDorman et al., 2007). Generally, married women can draw on support from both her family and her spouse's family, increasing her social support network of individuals who can help, during pregnancy. PR has been a U.S. territory

since 1900 by Foraker Law (Organic Act, 1900) which granted US citizenship to all persons born in PR, but studies on America do not routinely provide information specific to the Puerto Rican population.

Mathews et al. (2015) reported that the risk of IM increases significantly with decreasing gestational age. Cited among the reasons for this higher rate of IM are limited health access to medical resources and inadequate prenatal care in PR (Mathews et al., 2015). As a result, IM continues to be a serious public health and social problem (Garret, Wood, & Galley, 2007). Despite such health concerns, the IM rate for Puerto Ricans has decreased significantly in the last years (National Vital Report[NCHS], 2018). However, according to the (NCHS), 2018), the risk for non-Hispanic Black women in PR is still high; IM is 77% more likely for these women when compare to non-Hispanic White women (NCHS, 2018).

Generally, many initiatives from the CDC, National Institute of Health, WHO, and the Puerto Rican government aim to reduce the number of infant deaths. One WHO initiative set a goal of putting an end to preventable deaths by 2030 in newborns and children under 5 years of age (WHO, 2016). Further, the National Institute of Health (2016) developed initiatives to assist, understand, reduce, and eliminate IM causes and has an initiative to promote conscientiousness on IM risk through more research development. There is a greater effort by government and health departments to decrease IM rates considerably; most deaths in children under 1 year of age are due to preventable, treatable, and congenital diseases (WHO, 2016). Further investigations and analyses are required to improve quality prenatal and care services as well as to learn about providing better access to family planning and effective techniques of nutritional monitoring of

women. My objective in this study was to describe the existing literature in the areas of IM in PR and its link between rural and urban areas. I will provide a discussion of the methods that were used in the analyses by reviewing the logistic regression and the multinomial logistic regression to examine IM during the period from January to December 2015. The main objective is to analyze the variables and establish, through the analysis of data, the risk of IM in PR and differences between rural and urban areas of the country.

Purpose of the Study

The purpose of this quantitative study was to explore, using a quantitative, descriptive research design, the possible reasons for the higher IM. I sought to address the relationship if any between infant mortality in the rural or urban regions of PR and how the health disparity affects the IM rate. In this quantitative study, I aimed to identify influencing factors (marital status, race, education level, and age of mother)that could affect the IM rate in Puerto Rican infants. A logistic regression analysis was used to identify risk factors on IM in the Puerto Rican population of mother to infant newborns (0 – 28 days) and post newborns (29 days to 12 months). The dependent variable will be IM, while the predictor variables were marital status, race, education level and age of mother and geographic localization to determine if these factors have increased disparities in IM throughout the 20th Century for infants 0 to 1 year of age in rural or urban regions of PR. I also aimed determine the level of disparity between human groups with respect to indicators that characterize them. The Index of Iniquities in Health is one synthetic indices, that is, that summarize simple indicators (Mathews & MacDorman, 2015), that I, used for measuring inequalities in health in different regions. Through this

study, I aimed to provide knowledge that can be used to establish new strategies that could promote a better quality of life for all infant populations.

Research Questions

Research questions must reflect relationships between variables under study. Because of the lack of information specific to PR, these questions are relevant for study. Based on this information, the following research questions were addressed:

Research Question 1**:** Is there a significant difference in the IM rate among women residing in rural areas of PR in comparison with women residing in urban areas of Puerto Rico?

$H_0$1: There is no significant difference in the IM rate among Puerto Rican women residing in rural communities, in PR, as compared to Puerto Rican women residing in urban areas, in PR.

H_a1: There are significant differences in the IM rate among Puerto Rican women residing in rural communities, in PR, as compared to Puerto Rican woman residing in urban areas, in PR.

Research Question 2: Is there an association between IM and health disparities among Puerto Rican women residing in rural communities of PR, in comparison with Puerto Rican women residing in urban areas?

$H_0$2: There is no association between IM and the health disparity rate among Puerto Rican women residing in rural communities of PR, in comparison with Puerto Rican women residing in urban areas.

H_a2: There are significant differences between IM and the health disparity rate among Puerto Rican women residing in rural communities of PR in comparison with Puerto Rican women residing in urban areas.

Research Question 3: Is there a difference in the association between IM and characteristics of the mother (age, marital status, levels education, and socioeconomic status) and infant characteristics (low birth weight and gestational age) based on whether the mother lives in a rural or urban area of PR?

$H_0 3$: There is no difference in the association between IM and characteristics of the mother (age, marital status, levels education, and socioeconomic status) based on whether the mother lives in a rural or urban area of PR.

$H_a 3$: There is a difference in the association between IM and characteristics of the mother (age, marital status, levels education, and socioeconomic status) and infants characteristics (birth low weight and gestational age) based on whether the mother lives in a rural or urban area of PR.

Conceptual Framework

The framework base for this study, was Roy's adaptation model (RAM), a meta theory adapted to other theories to create the model (Andrews, 2009). Frauley, (2017) stated, "The first variety of metatheory concerns the systematic and mainly descriptive examination of the structure of existing theory (i.e., an interrelated set of analytic concepts) to deepen and produce a more profound understanding of it" (p. 4).

RAM is a theory that supposes alteration of an adaptive mode (capacity to think and to adapt to individual surrounding) affecting other modes (positive adaptation) and some stimulus like residual factors (surrounding) that influence the individual adaptive

process (Andrews, 2009). I used this theory to IM importance and to apply this model to practice. Andrews (2009) claims that a "model is clearly defined and holistic because any change in internal or external surroundings produces a response as a whole" (p. 65). This model helped explain how health disparities in IM from a combination of four structures, social support of parents, focal stimuli in parenting triggers coping mechanisms, problem focused strategies, which are cognitive and behavior attempt to manage any situation, and emotion focused strategies, result in the absence of any effort to manage any situation. This model was appropriate because disparities in IM were arguably to combine variables, one of most important was a positive adaptation model of parents. Study analysis could be reinforced applying this theory to reinforce IM importance and applying its model to public health practice. The RAM is a scheme that shows a union of practice and is sustained by scientific and philosophical principles and is generally applied by nurses. In this study, I used the RAM (Figure 1) to support effective strategies and strengthen the positive adaptation in Puerto Rican mothers. Applying RAM through the valuation of data assisted me in data comparison related to IM and the adaptation process.

Basic structure Risk factor

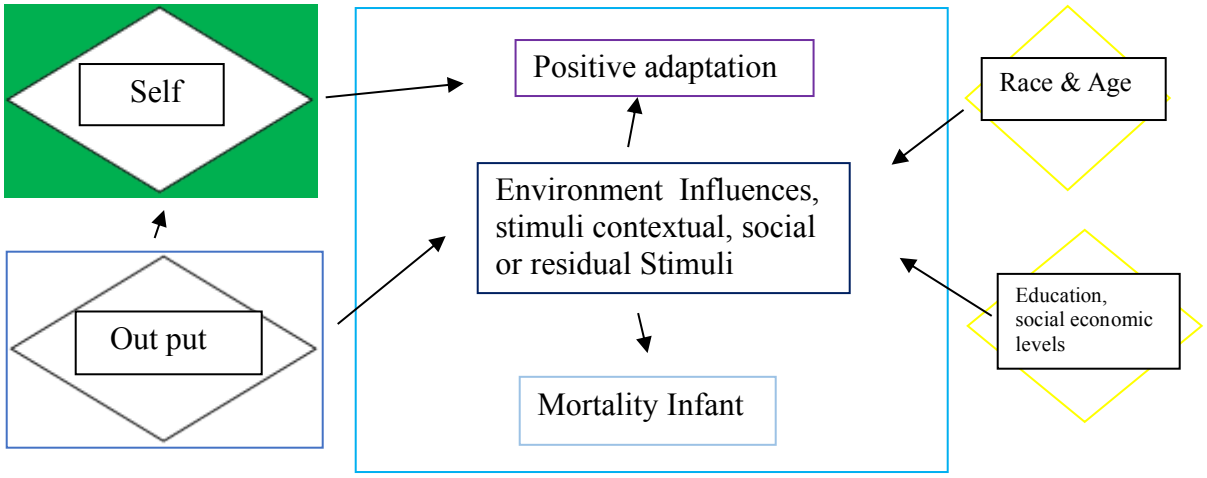

Figure 1. Conceptual structure derived from Roy adaptation model

The nature of the study, I used quantitative observational design, methodology that helped me describe and test relationships between variables and examine the risk factors that affect these relationships. In this study, I addressed the relationship, if any, between the health disparities and IM among infants 0 to 1 year of age born in PR. In this study I used secondary data from linked birth and death data sets certificates as NCHS. These cases included infant' deaths in 2015 of those classified as having a PR residence. The data included a U.S. certificate of live birth, and the variables for the study were from the live certificates. The datasets for this study instead a birth cohort, and death cohort, included a death cohort approach and linked the death certificates of infants younger than 1 year of age to their respective birth certificate from the same previous year. I am used descriptive and logistic regression statistical tests to assess the data.

I employed a quantitative methodology, using mainly online resources provided in reliable sources such as, but not limited to Medline Plus, Walden University Library, United States Census, Department of Health and Vital Statistics. Using these sources, I defined the most important parameters considered for review, justified the search, and how revision is made and used for the background data, Walden University resources, and the U.S. Census. The selected topic was broad, but there was a limited age range of 0 to 1 year of age include newborns (0-28 days) and post newborns (29 days to 12 months) born in PR. By limiting the age range, I focused on infants who are at a higher risk because this segment of population seems to be more vulnerable and requires a more in-depth investigation.

Definitions of Terms

After the term: The gestational age of a baby who was born with at least 42 full weeks of gestation (Osterman & Martin, 2013).

Complete term: The gestational age of a baby born between 39 and 40 completed weeks of gestation (Osterman & Martin, 2013).

Final pregnancy: The gestational age of a baby born between 37 and 38 full weeks of gestation (Osterman & Martin, 2013).

Health disparity: The health disparity is was measured by analyzing the data obtained between the IM rate and the population attributable risk. It is defined as the difference in health outcomes and the determinants (such as, social, environmental, and geographic) between segments of the population (James, 2009).

Infant mortality: Refers to death in the first year of life of a child born alive (Frisbie, 2009).

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 (Gray, 2009).

Infantile death: The death of a baby in the first year of life (Kitsantas & Gaffney, 2010).

Last term: The gestational age of a baby who was born with 41 full weeks of gestation (Osterman & Martin, 2013).

Late term: The gestational age of a baby born between 34 and 36 completed weeks of gestation (Osterman & Martin, 2013).

Live birth: The expulsion or complete removal of a product of conception from a mother, regardless of the duration of pregnancy, which, after said separation, breathes or shows any other evidence of life (WHO, 2013).

Neonatal mortality: Infant deaths that occur within the first 27 days after birth (Mathews & MacDorman, 2013).

Post neonatal mortality: Infant deaths that occur between 28 and 364 days after birth (Mathews & MacDorman, 2013).

Socioeconomic characteristics: Standard socioeconomic variables such as marital status and educational level (Vandresse, 2008).

Assumptions

In this study, I used secondary data collected from the vital statistics systems of PR. Therefore, there were several assumptions related to the representativeness of the population under study and the quality of the data reported. Not all the data required in the death certificate questionnaire were completed (doctors did not complete all the

fields). In addition, the information provided in death certificates and birth certificates did not contain information on Hispanic origin (although they were born in PR did not select the box Hispanic). Furthermore, the sample data were obtained from communities in PR that are representative of the population of PR. Finally, accurate data were obtained from the Department of Health of PR on the characteristics of the infant, the characteristics of the mother, social and community characteristics, and the historical context.

Scope and Delimitations

This study included newborns born in PR who died in their first year of life between January and December 2015 and whose mothers were between 18 and 45 years of age at the time of delivery. The groups who were not part of the study included (a) infants who had another Hispanic origin (not born in Puerto Rico). As it includes all the infant deaths registered in PR, the results are generalizable for this Puerto Rican population.

Limitations

Addressing the limitations of a study is a challenge. However, among the previously identified limitations there may be some alterations in the implementation of changes in birth certificates, which did not allow obtaining data of any variable included. There is also possibility that the secondary data used were not be represented because were not registered in accordance with the regulations of the demographic registration department of PR. Another possibility of this study is that the reliability of the IM rate can be affected by the limitation of the records. I used secondary data from linked birth and death datasets from NCHS. I did not use the information of the individual in an isolated way but used aggregate data of the entire population. The datasets describe the

mortality of the child population in relation to the variables of interest, such as marital status, race, education level, and age of mother. For the validity of this study, objectives have been formulated in a clear and quantitative way to leave very well seated from the beginning that is what you want to measure and avoid.

Information bias can be another limitation that comes from the omission of data or inaccurate information. In some cases, the validity of the registration data is not provided by the main source (father or mother). The limited data do not allow distinguishing between perinatal and postnatal mortality. This retrospective study was based only on secondary data from linked birth and death data sets from NCHS. I sought, to include the most realistic approximate number of the affected population and reduce a random or systematic error. The sample corresponded to the total population affected, which increased the precision, confidence intervals, and standard error. In addition, there is generally an increase in internal and external validity. However, the findings may not have external validity, which means that they can not necessarily be generalized to other Puerto Ricans outside the country or elsewhere.

In this study, I addressed the possible problems of comparability of some variables and reviewed the variables included in the data sets that indicated whether a variable was comparable between the revisions, using a secondary file data obtained from the NAPHSIS (2016). On the other hand, the main limitation of these studies is that they cannot determine if there is an association between an exposure and a disease at the individual level. However, allows to generalize the result because it is a problem that affects populations. Another major limitation of the study was the inability to control for potentially confusing variables. The variables used in the study were mostly demographic

in order to avoid a correlation with other variables and to be able to control by means of the statistical analysis.

Significance of the Study

Through this research, the gap in Puerto Rican IM rate may better help identify factors that are most important to the Puerto Rican population. In this study, I used the RAM (Andrews, 2009) to identify and compare risk factors, analyzing actual data that can produce greater discussion and investigation on IM disparities. 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 could lead to a decline in the IM. The knowledge from this study can also assist political leaders in making decisions on the allocation of resources that the mother needs in order to have a healthy newborn, leading to a decline in the IM. More research and resources are required on IM to implement a new early intervention model; and identify indicators that affect IM rate, prevalence, and incidence.

With this study, I hope to provide knowledge to health care professionals and, nursing students, and create community health initiatives, that can be used to improve and develop programs to help reduce the risk factors of infant death. It is imperative to provide means for children to be born stronger and healthier. The knowledge of this study can serve to establish new policies on aspects and decisions of maternal and child health that can allow increased access to health resources and improve strategies for prevention of IM.

Summary

In PR, IM by municipality is an important topic of discussion. Some areas outside the metropolitan area lack adequate resources for health. It is important to determine the possible factors that explain the mortality rate in Puerto Rican infants. The purpose of this quantitative descriptive study was to determine the infant and maternal characteristics that have an association with infant deaths among Puerto Ricans. In this study, I used a database that includes information on the birth certificate and the infant death certificate. The demographic data contained variables such as the date of birth, age and educational level of the parents, marital status, live birth order and the sex of the infant, among others. Health data included characteristics of the mother's age, marital status, prenatal care, place of birth, education levels, and race. The implications for positive social change include a better understanding of the factors that influence IM disparities among Puerto Ricans and general health activities of the mother and infant.

Chapter 2: Literature Review

Introduction

In this chapter I review several topics related to IM disparities. The literature is based on published information on IM, prevention of IM and the search for research on the causes of disparities in IM. In this section, I review the literature on the risk factors for IM, its consequences for health and how it affects the population. Through this review, I identified IM as one of the most important measures to determine the future health status of an infants in PR. In PR, some localities are identified as disproportionate because the number of infants with IM is still higher compared to other regions of the Caribbean (Ely, Driscoll & Mathews, 2014). In this section of literature review, I show the main causes of IM in PR. Because researchers have shown that the identification of risk factors associated with IM decreases its occurrence, the purpose of this study was to evaluate the factors that contribute to IM in PR.

According to Ely et al. (2014) and Mathews (2017), there are differences in IM between urban and rural demographic areas. In addition to review the differences between the groups depending on the differences in population distribution, I review the characteristics, such as the education of the mother or age, marital status, and race (MacDorman, 2011). Current research on the subject has revealed a variety of perspectives to try to understand what factors influence IM. There are researchers such as Ely et al. (2014) who studied differences in birth weight and gestational age. They are already the main indicators of IM. Other researchers such as Frisbie et al. (2009) considered the place of maternal origin, while others explored racial and ethnic differences (Hauck et al., 2011; MacDorman, 2011). In according to Hauck (2011),

identified the risk factors mentioned above, and it is necessary to determine which characteristics have an association with infant deaths among Puerto Ricans.

Literature Search Strategy

To carry out this literature review on the risk factors associated with IM, the following databases were reviewed: Full academic search, CINAHL plus with full text, Psychology ARTICLES and PsycINFO, PubMed and Google Scholar. I also searched the following websites: CDC, the WHO, and the National Research Institute. The following key terms were used: *low birth weight, maternal education, maternal age, modifiable behavior by the mother, gestational weight, risk factor, prenatal care, preconception, health education, infant mortality, and epidemiology of the newborn.* The initial search identified 116 items.

I reviewed each article and found 63 articles that reported risk factors for IM. I used the reference lists of the articles to find additional articles by using key terms directly relevant to the risk factors for IM. The purpose of this literature review was to highlight the importance and risk factors of IM: (a) maternal race, age, level of education, (b) geographical location, and (c) socioeconomic level. These risk factors help control the IM decline of the entire population, for example, Black, White, and other races / ethnicities. Ely et al. (2014) suggested the need for more research on IM to help find more data on the various factors that influence IM. The few research studies on IM in PR are not enough to counteract the persistence of a higher incidence of IM but help provide a clear understanding of this problem.

Conceptual Framework: Roy's Adaptation Model

The RAM is one of the most common frameworks used in research (Posmontier, 2008). The reason for choosing RAM for research is its ability to integrate multiple modes of adaptation of individuals. Therefore, RAM provides an effective framework to evaluate the adaptation of people regardless of their age or condition. Child mortality, without a doubt, is a problem that has merit and requires teamwork and new perspectives within the field of public health. The RAM theory its individual perspective, the modification of the factors and likelihood, action of the model is a theory that allows us to explore the functional relationship attributed to public health and the factors that they affect IM. The theory of adaptation explains how the availability of social support has an impact on the focus of prenatal care. Focal stimulus and contextual stimulus such as stress and economic and social support, affect the positive adaptation in the mother's environment. The theorical framework for this study is based on select model concepts of the RAM and is detailed in Figure 2. RAM can serve as an indicator of a mother's adaptation problems. The RAM theory has created a better way to show how the mother adapts positively to the stimuli by improving self-concepts and appropriately managing the stress-causing stimulus through an adequate social and emotional support system (Andrews, 2009).

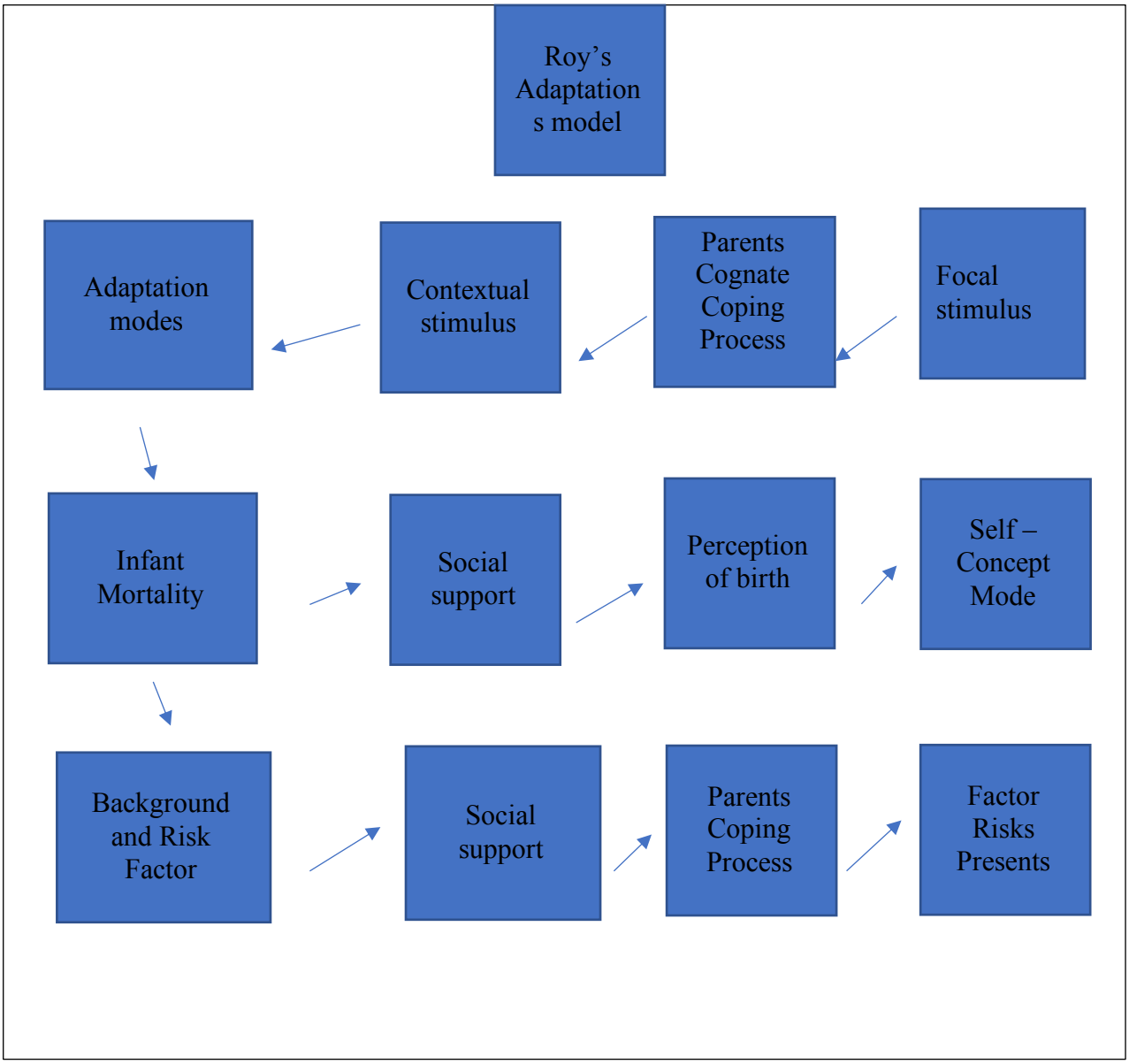

Figure 2. Conceptual structure derived from RAM

Infant Mortality Epidemiology

Previous researchers have emphasized the importance of maternal conditions during pregnancy for birth outcomes and later health conditions and IM (MacDorman, 2010). As a health indicator, infant mortality has a relationship with the health of the mother, accessibility, and the quality of medical care (MacDorman & Mathews, 2011). In PR, the IM rate is high (4.23 per 1,000 live births) compared to other Central American countries (NCHS, 2016). In the same way, other countries have more infant mortality rates. In 2013, the IM rate in Cuba was 2.28 per 1.00 live births (NCHS, 2016).

The NCHS staff began to produce infant mortality rates by Hispanic subgroups in the report data from 1995 (as cited in (MacDorman,1998) and an average of 3 years of infant mortality for states and territories in the 1998 data report (Mathews, Curtin, & MacDorman, 2000). In 1995, the overall rate of IM in the United States was 7.57 per 1,000 live births, while it was 6.3 per 1,000 live births among Hispanics (Mathews & MacDorman, 2013). In that year, the IM rate among Puerto Ricans in the United States was 8.9 per 1,000 live births (Mathews & MacDorman, 2013). The overall rate in the United States decreased to 6.89 per 1,000 live births in 2000; for Hispanics, the rate fell to 5.6 per 1,000 live births, while for Puerto Ricans the rate fell to 8.2 per 1,000 for live births (Mathews & MacDorman, 2013). IM rates were highest in rural counties (6.69 infants death per 1,000 live births), followed by small and medium urban countries (6.29) and large urban counties (5.49 NCHS, 2018). In the United States, the neonatal mortality rate for congenital malformations was highest in rural counties (105.12 per 100,000 live births) as compared to 94.07 with small and medium urban counties (NCHS, 2018). The

five leading causes of neonatal and IM is low birth weight, congenital deformations, maternal complications, placenta and bone, and bacterial sepsis (NCHS, 2018).

Howell, and Chassim (2008) suggested that racial disparities in IM were related to disparities in the quality of care. They carried out research on IM in various hospitals and clinical scenarios. To compare the IM rate according to their race between Black and White infants, they predicted that the mortality of Black babies would decrease to 4.8% if all were born in the same hospitals as White babies. The lack of quality medical attention was more frequent in rural than in urban communities.

Cause-Specific Infant Mortality

Racial disparity in IM has persisted over the last decade, despite overall improvements in IM rates. The justification for such an approach lies in the etiology of cause-specific IM, where some causes of death are influenced by maternal characteristic such as age, race, education levels, and marital status. The IM rates decline for all causes of, it if possible that continued racial and health disparity in infant survival is a product of differential improvements in causa specific preterm, low birthweight, birth defects, sudden infant's death syndrome, and maternal complications (Mathews & MacDorman, 2013). In 2016, the IM rate in the United States was 5.9 deaths per 1,000 live births. Over 23,000 infants died in the United States in 2016 (CDC, 2016).

Leading Causes of Infant Death

Preterm birth is when a baby is born too early, before 37 weeks of pregnancy have been completed. In 2016, preterm birth affected about 1 of every 10 infants born in the United States. Additionally, racial, and ethnic differences in preterm birth rates remain. For example, in 2016, the rate of preterm birth among African American women

(14%) was about 50% higher than the rate of preterm birth among white women (9%) (CDC, 2018).

Low birth weight. In 2015, preterm and low birth weight accounted for about 17% of infant deaths. Rural Countries had a lower IM for low birthweight (95.99 infant deaths per 1000,000 live births) compared with small and medium urban countries (105.70) and large urban countries (106.46) (NCHS, 2018).

Birth defects affect one in every 33 babies (about 3% of all babies) born in the United States each year. Major structural or genetic birth defects affect approximately 3% of births in the United States, are a major contributor to IM (*1,2*), and result in billions of dollars in costs for care (CDC, 2018). Sudden infant death syndrome. In 2016, there were about 3,600 (42%) in the United States. These deaths occur among infants less than 1 year old and have no immediately obvious cause.

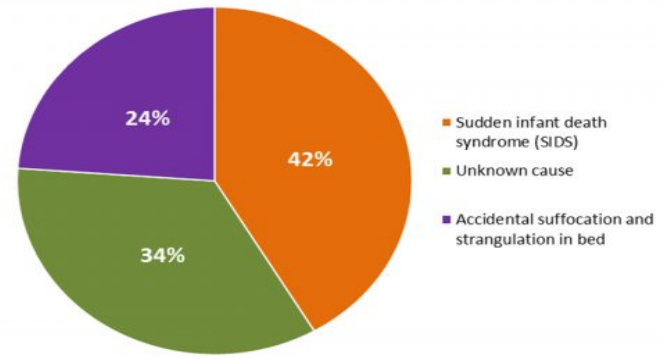

Figure 3. Source: CDC/ NCS, National Vital Statistic Compressed Mortality File

Maternal Pregnancy Complications

In according to NCHS (2016), rural counties also had a lower IM rate for maternal complications (32.78) compared with small and medium urban counties (41.68) and large urban counties (40.02) (NHCS, 2018). In the pregnancy occur problems of health, in any cases can involve the mother's health, the baby's health, or both. This complication affects more than 50,000 women in the United States every year. The most common are urine tract infection, gestational diabetes, hypertension, preeclampsia and eclampsia, mental disorders, obesity, hyperemesis gravidarum and anemia (CDC, 2018).

Prenatal Care Access

The interaction of social forces and innovation is evident in the broad knowledge of the importance associated with adequate prenatal care for fetal and infant health (Elder, Goddeeris, & Haider, 2011). This is largely due to the recognition that mothers who received good or adequate prenatal care had better health outcomes than those who received poor or insufficient prenatal care. As a result, fetal, infant, and maternal health has been reconceptualized in the United States. The current emphasis on prenatal care in Combined Health Services has attempted to combine the medical attention that women seek in pregnancy care with psychosocial counseling, home visits and social work, to address a wide range of psychosocial, nutritional influences, economic, psychological, cultural and medical factors that are recognized as important for child and maternal health (Atrash et al., 2006). Women may have barriers to access timely prenatal care. Oropesa, Landale, Inkley, and Gorman (2000) conducted a survey among Puerto Ricans in five states of the United States to identify the barriers women had for seeking timely prenatal care. In addition, pregnant women who initiate prenatal care receive medical

care that addresses pre-existing and existing conditions of pregnant women such as gestational diabetes, asthma, and infectious processes during pregnancy that may increase the risk of adverse outcomes in the fetus (Landale, Oropesa, & Gorman, 2000).

Socioeconomic Characteristics

Society and the community have their own traits and custom, it is the characteristics of the community or society that can influence IM, including the mother's access to adequate prenatal care. Although there is no research that includes PR or Hispanics in rural and urban areas according to studies that compared the results in clinics financed with federal funds in rural and urban communities. African American women in rural communities, who did not have health insurance, received primary health care. Some of the clinics reported a further decline in the rural and urban disparity gap in IM Some research that examined the cause of low birth weight in rural areas in the state of New York determined that variables such as maternal age, socioeconomic factors, drug/alcohol use and location were related to the cause of the disease (Politzer, Yoon, Shi, & Hughes, 2001). In PR, socioeconomic status was a major risk factor for IM among black communities, African-American blacks were significantly more likely than white (MacDorman, 2013), African Americans were 2.5 times more likely than Americans to have family incomes below the poverty level Field (2008) investigates neighborhood deprivation and premature birth among non-Hispanic white women and white women non-Hispanic in eight geographic areas of the United States, it was discovered that the link between the exposure of black mothers to neighborhood poverty and The low socioeconomic level has a detrimental impact on the results of birth. A result of low

socioeconomic status was little or no health insurance. Most workers in PR do not have health insurance coverage (MacDorman, 2013).

Maternal education has two main influences on child health: socioeconomic, which represents a woman's ability to acquire resources to ensure and promote the health of her baby (while using them to prevent ill health) and the knowledge that shapes their behavior before conception and during pregnancy. In addition, there is a third, less direct influence of socioeconomic status on pregnancy outcomes; and the sense of control (that women obtain as they reach higher levels of education) in child health. In the United States, there is a convincing inverse association between socioeconomic status and health that has existed for most of the 20th century (Singh & Kogan, 2007), where those with less education it has worse health outcomes than its more educated peers. As an indicator of socioeconomic status, education is considered the most reliable measure of class and social status (and preferable to other measures, such as income) for a variety of reasons. The effects of the higher socioeconomic level tend to operate through psychological well-being, that is, the sensation that a woman can affect her pregnancy process in a positive way. People with higher levels of education tend to have higher levels of psychosocial well-being. Higher levels of psychosocial well-being (measured by self-efficacy, self-control, and self-esteem) help reduce poor pregnancy outcomes by decreasing the chances of preterm birth (Hogue, Hoffman, & Hatch, 2001).

Maternal Age

The effects of maternal age on the health and survival of the baby are not simple or one-dimensional. Most of the research on IM in the United States has documented a non-linear relationship between maternal age and fetal and infant health, where the

highest risk of precarious pregnancies and infant outcomes are younger and older mothers (MacDorman et al., 2007).

The biological immaturity of younger mothers has been identified as a risk factor for poor child health (Olausson, Cnattingius, & Haglund, 2001). However, most of the risk to young women is involved in social disadvantage, due to their relatively low levels of socioeconomic status. These women are also more likely to have poor nutrition and diets, to become pregnant unintentionally, and less likely to know about their pregnancy, which decreases the likelihood of early prenatal care (Schmid, 2013) and puts them at a higher risk level. There is a risk of some poor child health outcomes, such as neural tube defects due lack of early folic acid supplementation, and younger mothers are also more likely to smoke during pregnancy, which increases the risk of giving birth to a premature low birth weight baby (Gage, Fang, & Stratton, 2008).

The high risk of poor child outcomes among older women has been documented in much of the previous research on maternal health and child outcomes and is thought to have its roots in the physiological deterioration It occurs with aging, but also in the greater likelihood that older women will use reproductive technologies to conceive. As maternal age increases, women not only experience a natural process that reduces their chances of health outcomes in pregnancy, but also the cumulative effects of toxins (Gage et al., 2008). On the other hand, women between 35 and 39 years of age, have a high risk of giving birth to a baby with stenosis of the pulmonary valve with ventricular septal defect (OR = 2.5, 95% CI: 1.2% to 2.013 5.1% (Gill et al., 2012). Finally, among women of 40 years of age, there is a high risk of giving birth to a baby with ventricular septal defects, cone ventricular anomaly (OR = 3.1, 95% CI: 1.2% (7.8), Gill et al., 2012).

Powers (2013) found that there was an increase in the percentage of labor complications among women 30 years of age or older. Compared to non-Hispanic whites, women of Mexican origin had a lower risk of IM up to ages 25 to 29 (Powers, 2013).

Others author reference, the older women had fewer antenatal hospital admissions and, except for screening for Down Syndrome, fewer pregnancy health care consultations than younger women (Klemetti, 2011). According to Sanders & Jones (2018), the appearance of non-optical and recombination defects in fetal oocytes and the correlation between altered recombination and human trisomy's make it clear that the problem is not limited only to divisions meiotic. On the other hand, the most important risk factor for aneuploid that increases maternal age is not a single entity. Age affects individual chromosomes differently and for some chromosomes it is likely that there are many ways of age-related non-disjunction (Sanders & Jones, 2018).

Definitions of older maternal age vary, there is general agreement that perinatal health risks are more prevalent amongst older than younger women. Maternal mortality, while rare in high-income countries, is twice as prevalent among women aged older than 35 than those younger than 30 years attributed to pulmonary embolism, amniotic fluid embolism and hypertension (Ataullah & Freeman, 2005). Jolly, Sebire, Harris, Robinson, and Regal (2000) investigated 385,120 pregnancies in North West Thames Region, England and compared outcomes in women aged 18 – 34 years with those of women aged at least 35 years. Rates of gestational diabetes (OR 2.63, 99% CI 2.40 – 2.89); placenta previa (OR 1.93, 99% CI1.58 – 2.35) and breech presentation (OR 1.37, 99% CI1.28 – 1.47) were higher among the older than the younger women (Jolly, et al., 2000). Hogue and Bremmer (2005) agree and suggest that the process of diminishing the

health of black women is premature aging and is the product of cumulative exposure to chronic stressors. Older women are more likely to delay reproduction due to educational or professional concerns.

Maternal age has an association with IM. Kitsantas (2008) found that among older mothers of black newborns (OR = 1.38, 95% CI: 1.15% (1.72) and targets (OR = 1.41, 95% CI: 1.12% (1.81)) increased the risk of IM and low birth weight, maternal age also influenced the risk of death due to the sudden death of the baby (Kitsantas, 2008), among black women, having more than 35 years of protection from the death of the baby (OR = 0.53, 95% CI: 0.29% (0.95); This protective effect also occurred in whites, but did not reach statistical significance (Kitsantas, 2008) .However, the increased risk of sudden death of the newborn among the whites (OR = 1.83, 95% CI: 1.44% (2.33) (Kitsantas, 2008).

Levels of Nutritional Knowledge During Pregnancy

Nutritional education is considered an important tool for promoting a healthy lifestyle but has not been studied as a determinant for maternal use of supplements during pregnancy. The relationship between nutritional knowledge and the use of folic acid, iron and multivitamin supplements during pregnancy, influence of socio-demographic factors and prenatal care is very important to promote nutritional recommendation for pregnant women (Allen, 2006). More studies emphasize the importance of the relationship between iron, folic acid or multivitamin intake and socio-demographic factors such as age, level of education, area of residence, marital status, parity, economic status and characteristics of prenatal care (including gestational age at the beginning of prenatal care and the number of prenatal consultations). According to Powers (2013), the age, level of

education, being married and low gestational age at the first prenatal check-up and total number of prenatal medical visits were positively associated with the use of folic acid, iron, and multivitamin supplements. The intake of vitamin and mineral supplements was significantly less common in women who declared the pregnancy was unwanted. Significant differences were noted in the use of folic acid and multivitamin supplements, but not in the use of iron supplements, depending on area of residence (rural versus urban) and parity. Women with a higher level of nutritional knowledge used folic acid, iron, and multivitamin supplements more frequently (Powers, 2013).

Education Levels

An example in which the influence of the behavior of maternal education on the results of child health is evident is with the defects of the neural tube defect (NTD). There are limited researchers that published study regarding the education levels important to adequate maternal diet. Nearly 12 million records were analyzed. Births from mothers with 0, 1-3, 4-7, and 8-11 years of education resulted in crude ORs for low 5-min Apgar score of 3.1, 2.2, 1.8, and 1.3, respectively (reference: ≥12 years of education). The crude OR for mothers aged ≥41 years (reference 21-34 years) was 1.4, but no risk was detected for those with ≥12 years of education and those who gave birth by caesarean section (OR 1.0 [95% confidence interval 0.9-1.2]). Generally, the risk of a low 5-min Apgar score was found to increase as maternal age moved away from 21 to 34 years (OR 1.1-1.7), and for mothers with the same characteristics, the risk of a low 5-min Apgar score was found to decrease markedly as education level increased (adjusted OR decreased from 2.6 to 1.2) (Public Health, 2016). Women with higher levels of education are more likely to reach adequate levels of maternal dietary folate (which

protects against NTD defects) through nutrient-rich diets or the use of multivitamin supplements. It is likely that women with more education achieve protective levels of folate in the maternal diet, even when they do not plan to become pregnant (Eichholzer, Tonz, & Zimmerman, 2006).

This is important because about half of all pregnancies in the United States are not planned (Buttriss 2004; Chacko et al., 2003), which means that unwanted pregnancies that occur to women with higher educational levels are less likely. of being affected by NTD because their folate levels in the diet before conception are higher than their less educated peers. A well-established body of demographic and health research has documented health benefits for immigrants (Gorman 1999; Hummer et al., 2007).

Marital Status

Most of the demographic and public health research on child health has documented lower risks of poor pregnancy outcomes for married women than for their unmarried counterparts (MacDorman et al., 2013; Paul et al., 2008). Some suggest that the influence of marital status on fetal and infant health occurs in two ways: influencing the socioeconomic factors associated with pregnancy outcomes and influencing sociopsychological resources, such as emotional support for pregnant women.

The economic influence of being married versus being single probably is associated with the socioeconomic status of the home and prenatal care. This is likely to decrease the chances of a woman delaying the start of prenatal care (Egerter, Braveman, & Marchi, 2002). This is likely to decrease the chances of a woman delaying the start of prenatal care (Schmid et al., 2013).

Hispanic Paradox

The Hispanic Paradox is an interesting Phenomenon in which lower rates of adult mortality, lower rates of IM, and lower rates of premature births and comorbidities are observed for Hispanic immigrants (lower than Hispanic women living in their native countries). It has been suggested that maternal birth influences the health and survival of the baby in three ways; through the protective elements of culture, the selection of healthy people for migration and data deficiencies. In terms of cultural influences of maternal nativity on child health and survival, much of the demographic research on the protective effects of the native maternal state on child health is based on the experience of Hispanics in the United States where it is believed that immigrants are protected by their culture (i.e., religious practices, dietary preferences, etc.). Public health and demographic researchers have shown that immigrants to the United States show better-than-expected health outcomes given their relatively low socioeconomic status, due in part to behaviors that protect pregnancy (such as marrying partners and attending to the church, strong family support, "Latino cultural orientation"). However, some research suggests that the protective effects of culture for immigrant women "disappear" over time and that the longer immigrant women spend in the United States, the more likely they are to abandon protective cultural practices and acquire deficient behaviors (Smith, & Bradshaw, 2006.)

This influence also applies to the children and grandchildren of immigrants, whose health behaviors resemble native women and, as a result, experience an increased risk of IM and other poor outcomes of pregnancy, such as poor fetal and child health, the longer they stay in the US. Landale and colleagues have shown that the hypothesis of

cultural protection is limited in its ability to explain differences in pregnancy outcomes among women born in the country and abroad (Landale et al., 2000).

Analyzing the data on Puerto Rican mothers, they found that the children of Puerto Rican immigrants in the US, have lower risks of IM than the children of Puerto Rican women on the mainland. In addition, the risk of infant death for newly immigrated mothers is lower than for women who remained in PR. Given that Puerto Ricans are US citizens, there is little reason to suppose that immigrants from PR benefit from assimilating to the American culture (therefore, there is less desire to Americanize). The lower risk of infant death for Puerto Rican women who migrated versus those who did not, and women born in the Americas seems to suggest the presence of a selection effect where the healthiest and most resistant women choose Migrate (Landale et al., 2000).

Therefore, if the healthiest women choose themselves for migration, they are also more likely to bring their pregnancies to term and deliver healthier babies than women who did not migrate. Essentially, what this argument suggests is that immigrants have better health outcomes because they are healthier before they arrive. An alternative hypothesis that has not yet found strong support in terms of IM literature is the "salmon bias", where the health and survival advantage of Hispanic children is an artifact of child migration return of less healthy immigrants to their country of origin. This arises from the need for cultural aspects (fewer social demands and greater social empathy), once they establish adequate patterns in health aspects, improve their knowledge and education they decide to return to their environment (Smith, & Bradshaw, 2006).

Essentially, this explanation affirms that immigrants in the poorest health return to their countries of origin to give birth or die, leaving behind only the healthiest

immigrants. Since these babies do not appear in the US IM data files. They seem to have survived, which produces an artificially low IM rate for Hispanic women of foreign origin. Considered as a possible explanation of the Hispanic Paradox in adult health and mortality, it is less likely that salmon bias will be the source of the survival advantage of the foreign born in the results of the recent birth.

Maternal age was one of the important parental characteristics. An examination of age-specific IM rates, Hummer et al. (2007) concluded that for the salmon bias to be the source of the advantage of foreign-born Hispanics over IM, immigrant women will have to return to their country of origin a few hours after childbirth, taking with them babies born in the United States. Given that a large proportion of infant deaths occur during the neonatal period (0-7 days after birth), it seems unlikely that the Hispanic paradox is the result of the migration of immigrant women to their countries. of origin for many reasons, the least of which is that few mothers will endanger the health of their newborns by making such a strenuous trip.

Summary

IM is an important indicator of the health of a country's health (MacDorman & Mathews, 2009). Puerto Ricans in the United States and PR have the highest IM rates in comparison with the general rate in the United States, and the rates of Hispanics as a group and among Hispanic subgroups (Bezares Salinas & Col n de Cartagena, 2012a; Mathews & MacDorman, 2013). In according to Bureau of Vital Statistic (2018), From 2001 to 2010, infant mortality rates declined among infants born to non-Hispanic whites (33%), other Hispanics (17%), non-Hispanic blacks (14%), and Puerto Ricans (6%). During the same time, the IM rate for infants born to Asians and Pacific Islanders

fluctuated between a low of 2.5 in 2002 and a high of 3.7 in 2005. Among all ethnic groups, infants born to non-Hispanic black mothers and Puerto Rican mothers in 2010 had higher risks of dying within their first year of life, with 8.6 and 6.4 infant deaths per 1,000 live births, respectively. Therefore, to identify the characteristics associated with IM among Puerto Ricans, I used a framework centered on the assumption that child survival depends on biological characteristics. Given that behavioral characteristics, maternal age, and socioeconomic characteristics also influence the biological characteristics that determine the survival of a child (Vandresse, 2008.)

Lack of prenatal care may increase the risk of adverse pregnancy outcomes, such as premature birth and low birth weight (Cox et al., 2011; Oropesa et al., 2000). Given that most infant deaths occur between low-birth-weight babies or those with less than 37 weeks of gestation, these characteristics are extremely important when studying IM (Mathews & MacDorman, 2013). Among Puerto Ricans, most infant deaths are the result of premature delivery. However, congenital anomalies represent one of the main causes of IM (MacDorman, 2011; Mathews & MacDorman, 2013).

The age of the mother (Kitsantas, 2008, Lisonkova et al., 2013), the reproductive history (Kitsantas, 2009: Wingate et al., 2012), and the state of health of the mother before and during pregnancy (Mocarski & Savitz, 2012; Tovar et al., 2012) can all increase or decrease the risk of an adverse pregnancy outcome. Finally, maternal education and marital status (Powers, 2013; Sullivan et al., 2012) can influence the behavioral characteristics of the mother. In the same way, race, ethnicity, and birth (Landale et al., 2006; Rosenberg et al., 2005; Sullivan et al., 2012) influence pregnancy outcomes through complex interrelation risk of factors.

Chapter 3: Research Method

Introduction

The purpose of this quantitative descriptive study was to explore the possible reasons for the increased IM experienced by Puerto Rican women in the rural areas of PR as compared to Puerto Rican women in the urban areas of PR. The study population consisted of all Puerto Rican mothers residing in rural areas and all Puerto Rican mothers residing in urban areas and birth of infants registered and born in 2015. I used the files of death certificates of infants born in the period from January 1, 2015 to December 31, 2015 according to the files from the National Association of Public Health Statistics and Information Systems Registry of Deaths of the Health (2018). In this chapter I include the design and the fundamentals of the research, methodology, threats to validity, and summary. In the design and research justification section, I present information related to the study design and, dependent and independent variables. The methodology section includes information on the population under study, sampling procedures and data files, instrumentation and materials, variables implementation, and the data analysis plan.

Research Design and Approach

The dependent variable or criterion was IM (a combination of neonatal and postnatal mortality). The independent or predictor variables, hypothesized as possible risk factors for IM, included infant weight, gestational age, and maternal characteristics. Socioeconomic characteristics included residence (rural or urban zone), year of birth of the baby, age of the mother, level of education of the mother, marital status of the mother, and place of birth of the baby. The design and research approach was carried out as a retrospective analysis using secondary file data obtained from the NAPHSIS (2016). In

addition to obtaining confidential data to research purposes, I requested files from the National Association of Public Health Statistics and Information Systems. Once I obtained the authorization and approval of my application, I began the data analysis.

A descriptive and inferential statistical analysis was carried out to examine IM from January 1, 2015 and December 31, 2015, in which I explored effects of the characteristics of the babies, the characteristics of the mothers, the characteristics of the community, and the historical context of the IM. I sought, to evaluate the resources of attention and access to health services in Puerto Rican population. I analyzed the child population from 0 to 365 days of birth during the year 2015 in PR. I identified, through data analysis, the disparities in the incidence of low birth weight, pre-birth term, the characteristics of the mother (age, marital status, levels of education, and socioeconomic status of newborns in PR of Puerto Ricans mothers living in areas rural and urban, based on the RAM to quantify the factors relevant to health disparities through the selected variables. A correlational research design was used to create empirical models that can predict future events from the current data (see Howell, 2008). The empirical models created in this study addressed the statistical relationships between a dependent or criterion variable (IM) and several independent risk factors that can be predictors of IM.

Population

The population consisted of infants, aged 0 to 365 days, who died between January 1, 2015 and December 31, 2015, and women residing on the island of PR. In this study, for the year 2015, I selected all Puerto Rican infants who died within their first year of age in PR, whose mothers were between 15 and 45 years of age at labor, and for whom NCHS staff was able to link the standard certificates of death and live birth. The

selection was stratified by the revision of standard certificates of live birth in order to have controls representative of the population from where the cases arose. The data sets of both groups children who died and children who survived during the first year of life (365 days) of 2015 were used. For the selection of Group 1, I used the selection menu randomized of the death cases. The selection of Group 2 was stratified considering the characteristics of the infant, which included premature births and low birth weight. I used Power G analysis to determine the power of the study. The entries were the 222 groups (1) and 300 groups (2) with a *SD* of 0.5 and a CI of 95 %, the power of this study was 80%. In the total population there were 222 infant deaths and 300 alive infants. The population of mothers in PR is diverse (Hispanic White 66%, African American 34%). However, the racial/ethnic characteristics of urban areas is quite different (White 76%, African American 24%; CDC, 2016).

Instrument and Variables

This study was based on secondary/archival data. Powers (2013) and Mathew and MacDorman (2013) used data linked to the death of newborns and babies as a source to study IM. The standard death and live birth certificates are the model for the collection of vital events while promoting a data collection process that is uniform (Weed, 2008). The last review of standard death certificate and live births was the 2003 review (Weed, 2008). Implementation for this actualization is 9.6% of the jurisdictions implemented the 2003 revision of the standard live birth certificate. These instruments along with my study guide complemented the data, in a way that allowed me greater organization of and accessibility to the information.

The dependent variable was IM, the independent variables, which represent the risk factors of IM were based on a control case model are the following: communities of Puerto Rican mothers, ethnic group of mothers, year of birth of the baby 2015, infants, birth weight, gestational age, mothers age, level of education of the mother, marital status of the mother, socioeconomic status of the mother, place of birth of the baby, and prenatal health care attention.

Data Analysis

After approval was received, I contacted the NAPHSIS, and data were provided as an SPSS data file. The statistical analysis was done through SPSS (v. 21.0). This study was a descriptive analysis, so prior to beginning the analysis, data were cleaned and coded, and errors were corrected or removed. Cleaned data were then imported and stored in an external memory drive.

Research Questions

The following research questions and corresponding hypotheses were assessed in relation to this data analysis plan:

Research Question 1**:** Is there a significant difference in the IM rate among women residing in rural areas of PR in comparison with women residing in urban areas of Puerto Rico?

$H_0$1: There is no significant difference in the IM rate among Puerto Rican women residing in rural communities, in PR, as compared to Puerto Rican women residing in urban areas, in PR.

H_a1: There are significant differences in the IM rate among Puerto Rican women residing in rural communities, in PR, as compared to Puerto Rican woman residing in urban areas, in PR.

Research Question 2: Is there an association between IM and health disparities among Puerto Rican women residing in rural communities of PR, in comparison with Puerto Rican women residing in urban areas?

H_02: There is no association between IM and the health disparity rate among Puerto Rican women residing in rural communities of PR, in comparison with Puerto Rican women residing in urban areas.

H_a2: There are significant differences between IM and the health disparity rate among Puerto Rican women residing in rural communities of PR in comparison with Puerto Rican women residing in urban areas.

Research Question 3: Is there a difference in the association between IM and characteristics of the mother (age, marital status, levels education, and socioeconomic status) and infant characteristics (low birth weight and gestational age) based on whether the mother lives in a rural or urban area of PR?

H_03: There is no difference in the association between IM and characteristics of the mother (age, marital status, levels education, and socioeconomic status) based on whether the mother lives in a rural or urban area of PR.

H_a3: There is a difference in the association between IM and characteristics of the mother (age, marital status, levels education, and socioeconomic status) and infants characteristics (birth low weight and gestational age) based on whether the mother lives in a rural or urban area of PR.

Descriptive statistics are those used for summarizing and organizing data (Frankfort-Nachmias & Nachmias, 2008). The ages at birth and gestational age were grouped using descriptive statistics (mean and standard deviation). I Performed measures of central tendency and dispersion for continuous variables. Measures of central tendency, mode, media, and arithmetic mean provided information regarding the distribution of observation located in the middle of the observations (see Frankfort-Nachmias & Nachmias, 2008).

The research questions guided the analysis in the study. Research Question 1: Is there a significant difference in the IM rate among women residing in rural areas of Puerto Rico in comparison with women residing in urbans areas of PR. The chi-square test and OR were used to compare the two portions of the population, indicating the mortality of infants of women residing in rural areas of PR with women residing in rural areas of PR, the significance value of the test was $p < 0.05$.

Research Question 2 addressed if there was an association between health disparity rates and IM among Puerto Rican women residing in rural communities of Puerto Rico, in comparison with Puerto Rican women residing in urban areas? A chi-square test and OR were used to test whether there were no significant differences in the health disparities among Puerto Rican women residing in rural communities, in PR, as compared to Puerto Rican women residing in urban areas in PR.

Research Question 3 addressed if there was a difference in the association between IM and characteristics of the mother (age, marital status, levels education, and socioeconomic status) based on whether the mother lives in a rural or urban area of PR.

Multiple regression was carried out to determine if the characteristics of the mother (age of mother, education level, and marital status) and infant characteristics (low birth weight and gestational age) were statistically significant predictors (p <.05) of IM. Multiple regression analysis I conducted several tests to determine differences among risk factors and the IM rate, used to predict IM (dead vs alive) used mother's characteristic as the predictor. I used the *OR* for significant variables in Table 1 and explain the strength of association between each one of them and the IM, for example, the association in IM and mother's education level or marital status. In this regression, I entered the covariables with statically significant *ORs* in the bivariate analysis and evaluated how the variables contribute to the prediction of IM. In PR there are huge disparities in health among infants. In 2016, the rate of preterm birth among African American women (14%) was about 50% higher than the rate of preterm birth among White women (9%) (CDC, 2018). The *OR* analysis was used to determine if there is a statistically significant correlation (p <.05) between annual IM in rural and urban communities between January 2015 and December 2015.

Table 1

Study Variables

Variable	Type	Measurement	Values
Infant death	Dependent	Categorical	1- Yes 2- No
Infant characteristic			
Gestational age	Continuous	Categorical	1- < 34 weeks 2- 35-39 weeks 3- 40 weeks 4- 41 weeks 5- 42 weeks

Birth weight **Maternal characteristic** **Socioeconomic characteristic**	Continuous	Categorical	1- Low birth weight (less than 3 lbs. 5 oz) 2- Normal birth weight (5 lbs. to 7 lbs. 13oz) 3- Hight birth weight (8 lbs. 13oz or more)
Country of birth	Covariable	Categorical	1- Puerto Rico 2- Other country 3- Unknow
Education	Covariable	Categorical	1- Do not complete Hight school 2- Hight school graduate 3- Associate degree 4- Bachelor's degree 5- Unknow
Marital status	Covariable	Categorical	1- Married 2- unmarried 3- unknow
Maternal age	Covariable	Continues Categorical	15-35 years 15 to 18 years 19 to 21 years 22 to 29 years 30 to 35 years Up to 36 years
Other variables			
Age of death	Independent	Continues Categorical	0-365 days 1- 0 to 28 days (neonatal) 2- 29 to 365 days (post neonatal)

Cause of Death	Independent	Categorical	NCHS's 130 causes of death
Place of birth	Independent	Categorical	78 municipalities of PR

Protection of the Rights of the Participants

Walden University Institutional Review Board approved the study (07-22-19-0437866) and I started working to the data, the secondary/file data of the PR statistics department was requested. There is no physical contact with the participants. When making the request for the data, I submitted an agreement that specifies the conditions to obtain access, the data elements, the explicit purpose of use and the expiration date that requires the destruction of the data files. I sign agreements as requested by the Health Department. All participant identifiers were removed from the data set to protect your participant confidentiality and anonymity. The findings of this study could be shared with the leaders of the community, the medical professions that serve the communities, schools and universities, representatives, and leaders of the communities of PR and public health professionals. The data that remains with the researcher will be kept for three years on a personal computer that can only be accessed by the researcher. The exchange of data can be achieved by publishing the results in an academic journal.

Summary

This is a quantitative study using a correlational research design to compare the IM rate among Puerto Rican mothers in rural areas and Puerto Rican mothers residing in urban areas in the communities of PR. The logistical regression Model was used as the rich framework to measure the dependent variables and the independent variables based on the data provided by National Association of Public Health Statistics and Information

Systems (NAPHSIS). Data collected and analyzed to address the research questions was discussed in this chapter. This Dissertation also discussed the implications for social changes and whether this study can be generalized to communities outside the study area.

Chapter 4: Results

Introduction

The purpose of this quantitative descriptive study was to determine which infant characteristics and maternal characteristics had any relationship with IM. Furthermore, I sought to ascertain if differences in mortality were correlated with residing in rural and urban regions of PR. The findings of this research were based on the analysis of 222 mothers of infants who died in the first years. I sought further clarification regarding variables' potential connection to newborns (0 days to 28 days) compared to post newborns (29 days to 365 days). These deaths occurred between January 1, 2015 and December 31, 2015. The respective statistical analyses and findings corresponded to the questions that led the investigation.

The research questions and hypotheses of the study were as follows:

Research Question 1**:** Is there a significant difference in the IM rate among women residing in rural areas of PR in comparison with women residing in urban areas of Puerto Rico?

$H_0$1: There is no significant difference in the IM rate among Puerto Rican women residing in rural communities, in PR, as compared to Puerto Rican women residing in urban areas, in PR.

H_a1: There are significant differences in the IM rate among Puerto Rican women residing in rural communities, in PR, as compared to Puerto Rican woman residing in urban areas, in PR.

Research Question 2: Is there an association between IM and health disparities among Puerto Rican women residing in rural communities of PR, in comparison with Puerto Rican women residing in urban areas?

$H_0$2: There is no association between IM and the health disparity rate among Puerto Rican women residing in rural communities of PR, in comparison with Puerto Rican women residing in urban areas.

H_a2: There are significant differences between IM and the health disparity rate among Puerto Rican women residing in rural communities of PR in comparison with Puerto Rican women residing in urban areas.

Research Question 3: Is there a difference in the association between IM and characteristics of the mother (age, marital status, levels education, and socioeconomic status) and infant characteristics (low birth weight and gestational age) based on whether the mother lives in a rural or urban area of PR?

$H_0$3: There is no difference in the association between IM and characteristics of the mother (age, marital status, levels education, and socioeconomic status) based on whether the mother lives in a rural or urban area of PR.

H_a3: There is a difference in the association between IM and characteristics of the mother (age, marital status, levels education, and socioeconomic status) and infants characteristics (birth low weight and gestational age) based on whether the mother lives in a rural or urban area of PR.

In this chapter, I present the statistical analysis and findings corresponding to the research questions that the investigation, process to the data collection, and the results of the study. The descriptive analyses were performed for the dependent and independent

variables. For each research question, I present the findings of the descriptive analysis, Kolmogorov-Smirnov test, U-Mann test, bivariate analysis, and logistic regression analysis after evaluating the assumptions.

Data Collection

The data collection consisted of identifying 2015 linked-infant death files for PR. After obtaining IRB approval from Walden University (approval number 07-22-19-0437866), PR provided me with the data file by mail. The data included information on the birth and dead of infants. I converted the data and codified them into SPSS format. With this file, I was able to identify that in 2015, there were 224 infant deaths and among these, 222 of the infant deaths, and, met the inclusion criteria. Two were excluded due to PR. In the same year, there were 31,229 live births in PR. Thus, in 2015, the weighted IM rate for PR was 6.61 per 1,000 live births. The final unweighted sample for Puerto Rico was 522 participants.

Results

In this section, I show the findings of the study, beginning with the descriptive statistics, followed by the results as they relate to each of the research questions. After presenting the descriptive statistics, I then present the results of several analyses, including multivariate analysis. In this study, the maternal characteristics with the highest percentages were educational levels, 30% of the mothers had a high school diploma, and marital status, 68.0% were unmarried, and the median age at delivery was 21 years. The infant' s characteristics with highest percentages were child weight (21.7% was 1 pound or under) and infant's death (20.7%). In addition, 70% of infant deaths in PR are occurred preterm, between 34 and 36 weeks of gestation.

Descriptive Analyses

In 2015, PR, there were 31,229 live births among women of Puerto Rican origin who were between 15 and 45 years of age. Among this group, the weighted IM rate was 6.16 per 1,000 live births. The median age of infant deaths of Puerto Rican origin was 5.7 days. Among those who died, 51.0% were male, and the mean birth weight was 2.0 ± 6.0 pounds. The mean Apgar score among the infants who died was 5.0 ± 3.6, while it was 8.6 ± 0.7 among those who survived. For infants who died, the mean number of prenatal care visits was 8.0 ± 4.7; for infants who survived, the mean was 10.6 ± 3.9.(see Tables 2 and 3).

Table 2

M*easures of Central Tendency Among Infant Death of PR 2015*

Variable	*N*	Mode	Median	Mean	Std. Deviation	Range
Five minute Apgar score	222	8	6.0	5.0	3.6	10
Birth weight (pounds)	222	1	3.25	2.0	6.0	5.0
Number of gestational weeks	222	39	38.0	33.9	14.59	82
Number of fetal losses and abortions	222	0	0	0.5	1.0	5
Weight gain at delivery	222	0	10.0	12.4	16.9	88
Number of previous cesarean deliveries	222	0	0	0.2	0.5	5
Number of previous live births	222	0	1.0	1.1	1.4	7
Month prenatal care began	222	1	1.0	2.5	2.0	7
Number of prenatal care visits	222	10	9.0	8.8	4.7	12
Maternal age (years)	222	21	26.4	25	7.48	30
Age at death of infants (days)	222	0	6.22	4	79.3	353

Table 3

Measures of Central Tendency Among Infant' Life/Birth of PR 2015

Variable	*N*	Mode	Median	Mean	Std. Deviation	Range
Five minute Apgar score	300	9	9.0	8.9	0.7	9
Birth weight (pounds)	300	7.5	7.11	7.06	1.24	9
Number of gestational weeks	300	39	39.0	38.5	3.7	77
Number of fetal losses and abortions	300	0	0	0.5	1.0	6
Weight gain at delivery	300	30	29.0	29.0	13.1	98
Number of previous cesarean deliveries	300	0	0	0.2	0.6	3
Number of previous live births	300	0	0	1.1	1.3	7
Month prenatal care began	288	2	3.0	3.0	1.5	9
Number of prenatal care visits	300	12	11.0	10.6	3.9	30
Maternal age (years)	300	19	24.7	25.1	6.2	30

Figure 4 reflects the distribution of infants and days of life among infants who died during the first 2 months. It is observed that the larges one day old (46 deaths) followed by infants 2 days old (37 deaths). The median age at death was 7.83, with standard deviation at 9.347 days of age. Figure 4 shows that 20.7% (n = 46) of infants died on Day 1 and 16.6% (n = 37) died on Day 2.

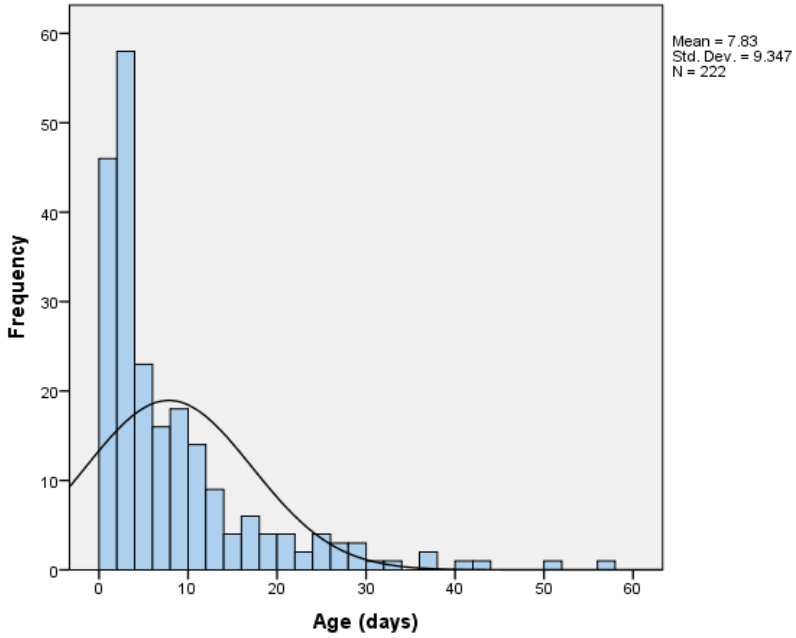

Figure 4. Distribution of Puerto Rican infants' days of life 2015

Table 4 shows the results of distribution by woman residing in areas where they reported cases of IM for the period from January 1 to December 31, 2015 in PR. Urban zones has the highest incidence of IM at 55.50%, compared to rural zones at 44.5%.

Table 4

Distribution of woman among residing zone

			Mothers/Infants live birth	Mothers/Infants death	Overall percent Live birth	Overall percent death
Residence Zone		Rural Urban	134 166	98 124	42% 58%	44.5% 55.5%

Table 5 shows the results of distribution by municipalities where they reported cases of IM for the period from January 1 to December 31, 2015 in PR. The municipality

with the highest incidence of IM is San Juan City 49.9% (North Region), followed by Ponce City 15.3% (South Region). IM rates were higher in urban zone compared to rural zone. By using maternal residence provided on the birth certificate to examine infant death by rural or urban zone, if possible, to capture differences in mortality rate that could be related to differences disadvantaged community environments for example access to health care services.

Table 5

Municipalities Mortality Infants Death Place Report, Puerto Rico, 2015

		Frequency	Percent
Valid	PUERTO RICO, ARECIBO	5	2.3
	PUERTO RICO, ARROYO	1	.5
	PUERTO RICO, BARCELONETA	1	.5
	PUERTO RICO, BAYAMON	8	3.6
	PUERTO RICO, CAGUAS	13	5.9
	PUERTO RICO, CAROLINA	6	2.7
	PUERTO RICO, CAYEY	11	5.0
	PUERTO RICO, GUAYAMA	2	.9

	PUERTO RICO, HUMACAO	3	1.4
	PUERTO RICO, LAS PIEDRAS	1	.5
	PUERTO RICO, LUQUILLO	1	.5
	PUERTO RICO, MANATI	9	4.1
	PUERTO RICO, MAYAGUEZ	8	3.6
	PUERTO RICO, NAGUABO	1	.5
	PUERTO RICO, PONCE	34	15.3
	PUERTO RICO, QUEBRADILLAS	1	.5
	PUERTO RICO, SAN GERMAN	4	1.8
	PUERTO RICO, SAN JUAN	109	49.1
	PUERTO RICO, SAN SEBASTIAN	1	.5
	PUERTO RICO, TOA ALTA	2	.9
	PUERTO RICO, VEGA ALTA	1	.5
	Total	222	100.0

Figure 5 reflects the distribution of mothers in weeks of pregnancy. Matthews and MacDorman, (2010) reported that the risk of IM increased significantly with decrease gestational age. It is observed that the largest distribution was 24 weeks with 31 participants, followed by 25 weeks with 26 participants. The median age at delivery was 21.2 years in the PR, 78.2% of infant deaths of Puerto Rican origin were preterm, and had low birth weight. Other, leading causes of infant death were bacterial sepsis of the newborn and respiratory distress 5.7%. There were 22.9 % of the mothers between 21 and 25 years of age and 0.5% between 15 and 17 years of age (Figure 5).

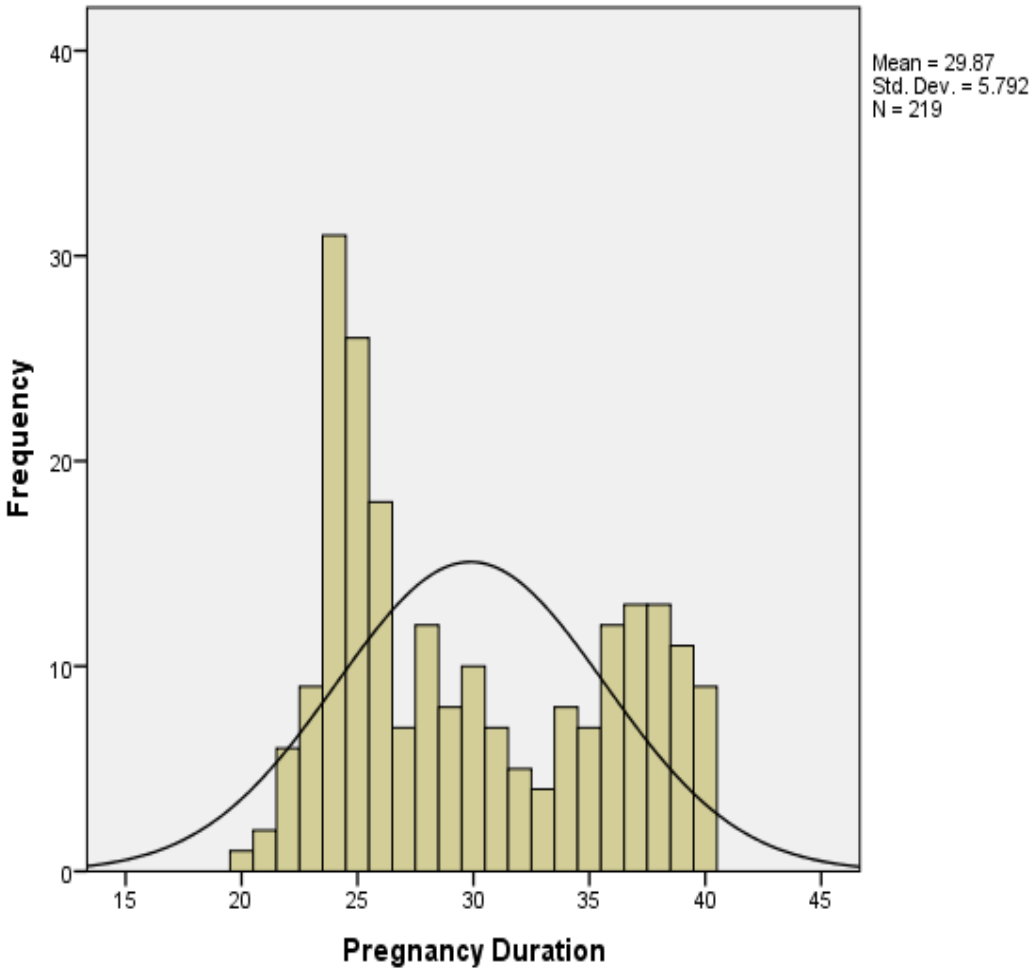

Figure 5. Distribution of pregnancy duration of Puerto Rican mothers 2015.

In 2015, the IM rate was highest for short gestation and low birthweight (78.2%) of leading causes of infants' death. IM case was higher in urban zone (124 cases) than rural zone (98 cases); there no significant difference between urban and rural zone in the IM rate. The neonatal mortality rate is 96.84%, were preterm was higher in urban zone than compared rural zone, and neonatal mortality rate for low birthweight is higher in rural zone than compared urban zone.

There were 96.84% of the infant deaths that occurred in the neonatal period, the remaining 4.16% died between the first month of live and the 12th month. The Table 8 results show 56.75% had low birth weight, 55.9% were male, and 74% were born at early or late preterm gestations. The mothers did not receive prenatal care in 6.6% during the first trimester. The mothers had adequate prenatal care 54%, and mothers did not receive adequate prenatal care 38.8%. The leading causes of death of these infants were congenital malformations 13.1%, respiratory problems 12.1% and sepsis clinical 5.7% (Table 6).

Table 6

Leading Causes of Death Among Infants born I alive in PR 2015

Cause of death	Frequency	Percent (%)
Disorders related to short gestation and low birth weight, not elsewhere classified (P07)	154	78.2
Congenital malformations, deformations, and chromosomal abnormalities (Q00-Q99)	26	13.3
Clinical sepsis (R95)	42	5.7

Table 7 shows the results of distribution by child weight where they reported cases of IM for the period from January 01 to December 31, 2015 in PR. The populations with the highest incidence of IM is low birth weight 41.0%, with one pounds weight or less of the total birth. In this study, 30% of the mothers had high school diploma, 68% were unmarried, and the median age at delivery is 21.4 years. The maternal characteristic

with highest percentages were cesarean associated with gestational hypertension. Almost 98% of the mothers were born in PR. Data shows that the largest distribution was one pound with 91 cases, followed by 2 pounds with 35 cases (Table 7). Additionally, the highest proportions of low birthweight among neonatal to mothers aged 20-30 years. For infants who died, the percent weight is 6.3% up 7 pounds; for infants who survived, the mean was 48% (Tables 7).

Table 7

Frequency Puerto Rico infant weight by pounds 2015

		Frequency	Percent	Frequency	Percent
		Infant died	Infant died	Infant Survived	Infant Survived
Valid	0	4	1.8	0	0
	1	91	41.0	0	0
	2	35	15.8	4	1.5
	3	19	8.6	14	4.6
	4	15	6.8	11	3.6
	5	18	8.1	36	12.0
	6	22	9.9	86	28.6
	7	14	6.3	143	48.0
	8	2	.9	28	1.0
	9	1	.5	2	.70
	Total	222	100	300	100

Figure 6 reflects the age distribution of the mothers. It is observed that the greatest age distribution was 21 years with 21 participants, followed by 23 and 25 years with 15 participants.

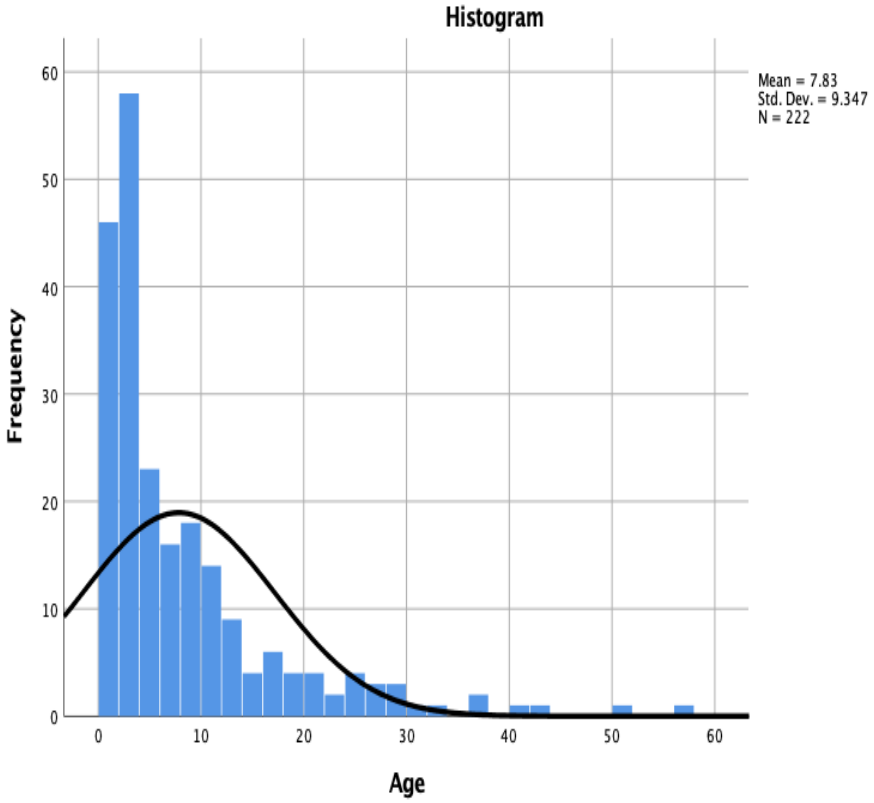

Figure 6. Distribution of Puerto Rican mothers age of infants deaths 2015.

Table 8 presents the distribution of the mother's education level. The result reflected that 29.3% of the mothers are graduated from high school. Followed by associate degree 23.4% and 14.9% with baccalaureate.

Table 8.

Puerto Ricans Mothers of infant death Educations Levels 2015

Mother Education					
		Infant Deaths		Infants Alive	
		Frequency	Percent	Freq	Percent
	Less than 8th grade	7	3.2	20	6.7
	Less than 12th Grade	28	12.6	50	20
	Some University /did not graduate	22	9.9	120	40.0
	Bachelor Degree	33	14.9	11	3.3
	Doctor Degree	2	.9		
	Associate Degree	52	23.4	38	12.6
	GED complete	65	29.3	48	16.4
	Master's degree	11	5.0	3	1.0
	Total	222	100.0	300	100

Figure 7 shows whether mothers live with the father of the child. This question shows that 68% of mothers are single and 32 % of participants married or convenience.

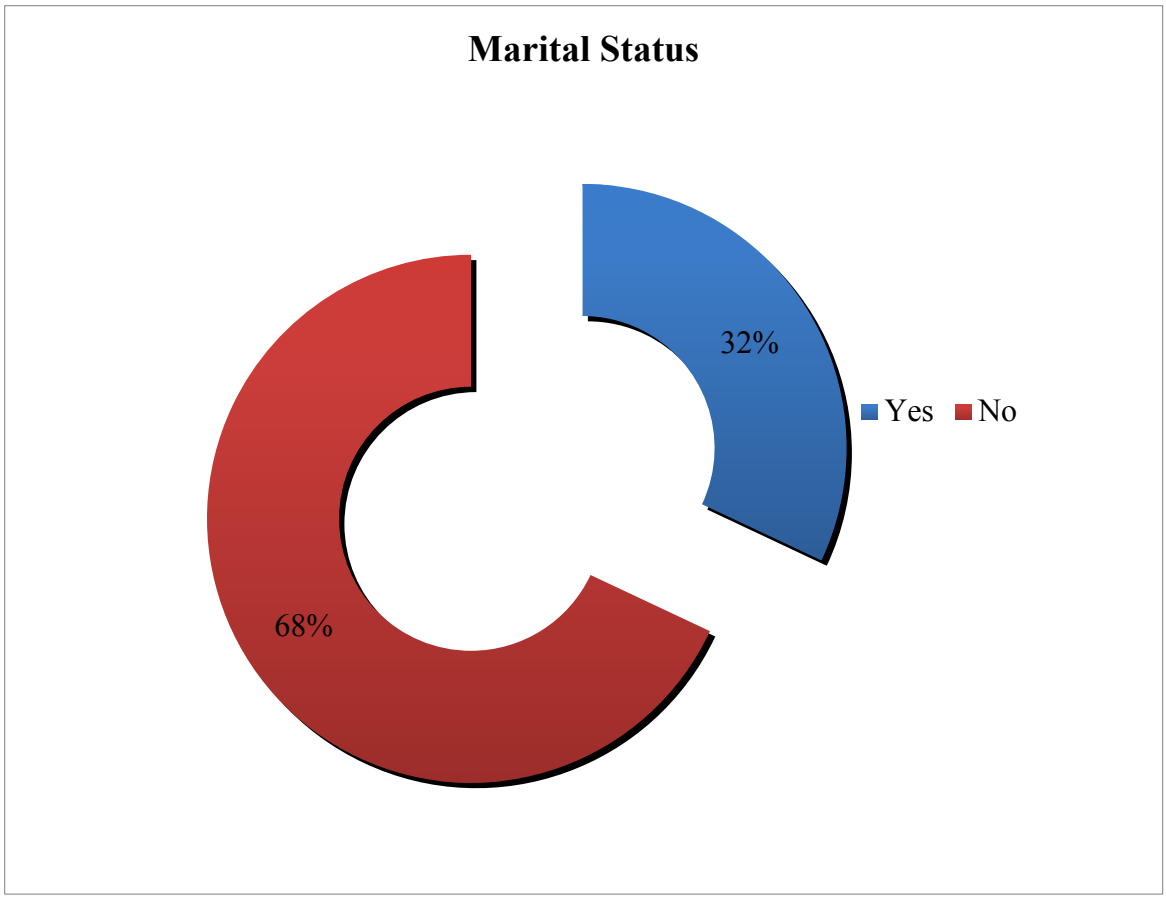

Figure 7. Puerto Rican mothers marital status 2015.

Research Question 1

Is there a significant difference in the IM rate among women residing in rural areas of PR in comparison with women residing in urbans areas of PR?

The results of the chi-square test among infants of PR, there was a statistically significant association between abortions with infant death, Pearson χ^2 (2, N = 522) = 13.076, $p < 0.001$. Similarly, there was a statistically significant association between previous live birth and infant death, Pearson χ^2 (2, N = 522) = 5.446, $p < 0.031$. Finally,

there was a statistically significant association between previous preterm birth and infant death, Pearson χ^2 (1, N = 522) = 22.908, p < 0.0001.

Table 9

Chi-Square Test Results of the Maternal Characteristics for IM Among Infants of PR 2015

Independent variables	Infants alive		Infant deaths		χ^2	*p* value
	N	%	*N*	%		
Total	300	48.5	222	51.4		
Abortions					13.076	< 0.001
None	114	45.78	108	58.1		
One	143	63.04	95	42.0		
At least two	43	48.6	19	51.4		
Previous live births					5.447	0.033
None	150	50.4	175	58.6		
One	121	49.6	37	42.4		
At least two	29	48.0	10	51.2		
Previous preterm birth					22.908	< 0.0001

Yes No	35 265	8.37 88.3	101 121	49.2 88.5		
Previous cesarean section					-	0.313
No	260	49.9	202	78.1		
At least one	40	50.8	20	36.2		

Odds Ratio.

For the statistically significant variables in Table 10. The odds of dying increased with the number of abortions of the mother [one previous abortion (OR = 1.328, 95% CI: 1.056– 1.890) and at least two abortions (OR = 2.540, 95% CI: 1.345 – 5.086)]. On the contrary, infants whose mothers had one previous live births had a lower odds of dying (OR = 0.831, 95% CI: 0.559 – 0.902) than infants whose mother have not had a previous live birth. Infants whose mother had a previous preterm birth had 8.331 times (95% CI: 3.086 –16.533) the odds of dying than infants whose mothers did not have a previous preterm birth.

Table 10

Odds Ratio Results of the Maternal Characteristics for IM

Among Infants of PR 2015

Independent variables	Odds Ratio		95% CI	
		Lower		Upper
Previous cesarean section No	Reference			
At least one	0.655	0.637		1.127
evious live births None	Reference			
One	0.831	0.559		0.902
Two	0.907	0.602		1.212
Previous preterm birth No	Reference			
Yes	8.331	3.086		16.533
Abortions None	Reference			
One	1.328	1.056		1.890
Two	2.540	1.345		5.086

Research Question 2

Is there an association between health disparity rates and IM among Puerto Rican women residing in rural communities of PR, in comparison with Puerto Rican women residing in urban areas?

To identify significant differences association in health disparity when using the weight in pounds of the child or at birth between the residential area where the mothers live, it was proved that there is significant difference in the health disparity among Puerto Rican women residing in rural communities, in PR, as compared to Puerto Rican women residing in urban areas, in PR.

The results of the chi-square test among infants of Puerto Rican, there was a statistically significant association between birth weight and infant death, Fisher's exact test $(N = 522) = 544.93$, $p < 0.0001$, with a strong association. For normal birth weight and excessive birth weight there were fewer infants than expected and for those with low birth weight the number was higher than expected among those infants who died. In addition, there was a statistically significant association between congenital anomalies and infant death, Fisher's exact test ($N = 522$) $p < 0.0001$. Similarly, there was a statistically significant association between gestational age and infant death, Fisher's exact test ($N = 522$) $p < 0.0001$, with a strong association.

Table 11

Chi-Square Test Results of the Infant Characteristics for IM

Among Infants of Puerto Rican 2015

Independent Infants alive			Infant deaths		χ^2	*p* value
variables	*N*	%	*N*	%		
Birth weight					544.93	< 0.0001
Normal	253	76.7	19	22.3		
Low birth weight	47	12.5	203	87.5		
Congenital anomalies					-	< 0.0001
None	273	50.6	44	49.4		
At least one	17	3.7	178	90.3		
Gestational age					-	< 0.0001
Full term	253	76.7	37	23.3		
Early preterm	37	5.9	187	94.1		
Late preterm	13	56.2	66	43.8		
Early term	274	71.7	106	27.3		
Late or post term	30	73.2	10	25.8		

Odds Ratio

For the statistically significant variables in the Table12, I explained the strength of association between each one and IM. In addition, infants with low birth weight had 27.66 times (95% CI: 20.083-34.602) the chances of dying than infants with normal weight. In addition, infants with at least one congenital anomaly were at 4.332 times (95% CI: 1.332 – 8.331) the chances of dying than infants without congenital anomalies. When analyzing the probabilities of dying by gestational age, the probabilities of dying decreased as the gestational age increased early premature pregnancy (OR = 49,081, 95% CI: 32.867 – 73.453), late premature pregnancy (OR = 2.016 95% CI: 1.927 – 3.048), and early pregnancy 1.488 (OR = 95% CI: 1.121 – 1.699)] compared to babies born in natural pregnancy.

Table 12

Odds Ratio Results of the Infant Characteristics for IM Among PR Infants 2015

Independent variables	Odds Ratio		95% CI	
		Lower		Upper
Birth weight Normal	Reference			
Low birth weight	27.666	20.083		34.602
High birth weight	0.380	0.341		1.314
Congenital anomalies None	Reference			

At least one	4.332	1.322		8.318
Gestational age Full term	Reference			
Early preterm	49.081	32.867		73.453
Late preterm	2.016	1.927		3.044
Early term	1.488	1.121		1.898
Late or post term	1.108	0.699		1.699

Research Question 3

Is there a difference in the association between IM and characteristics of the mother (age, marital status, levels education, and socioeconomic status) and infants characteristics (Birth low weight and gestational age) based on whether the mother lives in a rural or urban area of PR?

The results of the chi-square test for the maternal socioeconomic characteristics, there was a statistically significant association between maternal education and infant death, Pearson χ^2 (1, N = 522) = 40.024, $p < 0.0001$. Additionally, there was a statistically significant association between marital status and infant death, Pearson χ^2 (1, N = 522) = 11.157, $p < 0.001$. There was a statistically significant association between maternal age and infant death, Pearson χ^2 (2, N = 522) = 1.531, $p < 0.002$.

Table 13

Chi-Square Test Results of the Maternal Socioeconomic Characteristics for IM Among Infants of PR 2015

Independent variables	Infants alive		Infant deaths		χ^2	*p* value
	N	%	*N*	%		
	300	49.8	222	50.2		
Maternal education						
Graduate from high school	166	47.4	65	52.6		
Less than 12th grade	136	40.9	59	52.1	41.024	< 0.0001
Univerity Degree	82	61.1	87	38.9		
Marital status					11.072	0.001
Married	114	55.6	71.04	44.4		
Unma-rried	186	47.0	136	53.0		
Maternal age					15.031	0.002
25 – 29 years	150	50.0	70	51.2		
15 – 19 years	10	42.3	52	48.9		

20 – 24 years	112	48.8	68	51.2		
30 – 34 years	81	58.4	28	41.6		
35 – 45 years	2	54.9	2	25.1		

Odds Ratio

For statistically significance variables in Table 14, I explained the strength of association between each one of them and IM. Among infants of Puerto Rican, maternal education had an association with infant death. Infants whose mothers had less than high school diploma had a higher odd of dying (*OR* = 1.222, 95% CI: 1.011 – 1.444), while those whose mothers had more studies than high school had lower odds of dying (*OR* = 0.572, 95% 0.452 – 0.824) than infants of women with high school completed. Additionally, infants of unmarried women had a higher odd (*OR* = 1.310, 95% CI: 1.122 – 1.537) of dying than those infants of married women. Finally, infants of women between 30 – 34 years of age had a lower odd of dying (*OR* = 0.678, 95% CI: 0.427 – 0.940) than infants of women between 25 to 29 years of age (Table 14).

Table 14

Results of the Maternal Socioeconomic Characteristics for IM Among Infants of PR 2015

Independent variables	Odds Ratio		95% CI	
		Lower		Upper

Maternal education Graduate from high school	Reference			
Less than 12th grade	1.202	1.011		1.444
More than 12th grade	0.472	0.452		0.824
Marital status Married	Reference			
Unmarried	1.310	1.122		1.537
Maternal age 25 – 29 years	Reference			
15 – 19 years	1.301	0.941		1.780
20 – 24 years	0.899	0.752		1.272
30 – 34 years	0.678	0.427		0.940
35 – 45 years	0.652	0.542		1.113

Logistic Regression

The result of logistic regression analysis indicates that there is a 71.2% probability according to the results of the dependent variable if I know the place of residence of the mothers of the deceased infants. Wald's position for the model used indicates that the independent variable adds significance to the prediction of the dependent variable. The results obtained from this model demonstrate that the population can be generalized (Wald 3.031, gl: 1; $p < .001$). Logistic regression with backward

elimination based on the probability of the likelihood-ratio statistic was performed, from PR, 300 alive infants and 222 death infants (98.0%) were included in the model.

Logistic regression analysis is a group of statistical techniques that aim to verify hypothesis or relationships when the dependent variable is nominal, based on principles such as odds ratios and probabilities (Field, 2015). The dependent variable was IM. The hypothesis for this research was that the variables of the mother (age, infants characteristic, and socioeconomic characteristics) based on whether the mother lives in a rural or urban area of PR do not affect infant newborns. The next step was to analyze the Nagelkerke R-square, which indicates the part of the variance of the dependent variable explained by the model. The higher the R square, the more explanatory the model is, that is, the independent variables explain or predict the dependent variable (Field, 2015). The value of the Nagelkerke R^2 was 63.6%, so it is determined that some independent variables explain the dependent variable.

Odds Ratio: When analyzing the value of odds ratio, it is indicated that the longer the duration of pregnancy increases the number of days of life of the infant 1.348. In addition, the child weight reduces that last more than 28 days of life 2.59 (1 / 3.356), When compared to infants who were born at full term gestation. Although early term gestation had odds ratios higher than the number one, these odds ratio did not reach statistical significance.

For the statistically significant variables in Table 17, I explained the strength of association between each one and IM. In PR, infants with a score of babies born with low birth weight were 5.996 times more likely to die than babies born with normal weight. Similarly, the chances of dying decreased as gestational age (OR = 6.735) increased compared to infants who were born at term of gestation.

To finalize the binary logistic regression analysis with the dependent IM variable, the relationship of the independent variables with the dependent variable was interpreted when using the table of beta coefficients. The analysis showed that the variables that predict IM are child weight and pregnancy duration, given that the value of $p < .05$ (Table 15). This demonstrates that the child's weight and duration of pregnancy significantly affect IM. To carry out the logistic regression analysis, the Hosmer Lemeshow test was interpreted. What this test does is check if the proposed model explains what is observed in the prediction of the variables (Connell, 2006). It is a test where the distance between an observed and an expected is evaluated. Finally, based on Wald test, in this model, the following variables contributed significantly in predicting infant death: previous preterm birth, low birth weight, at least one congenital anomaly, full term gestation, and early preterm gestation.

Table 15

Logistic Regression Analysis Predicting IM Among Infants of PR

Variable	*B*	*SE*	*OR*	95% CI		Wald Statistic	*p* value
				Lower	Upper		
Step 1							
Maternal age							
25 – 29 years						4.936	0.292
15 – 19 years	0.220	0.286	1.247	0.710	2.188	0.594	0.440
20 – 24 years	0.410	0.250	1.505	0.920	2.462	2.666	0.101
30 – 34 years	0.013	0.313	0.985	0.532	1.824	0.002	0.963
35 – 45 years	0.532	0.343	1.706	0.864	3.360	2.400	0.120
Step 2							

Previous preterm birth	1.210	0.579	3.357	1.084	10.390	4.414	0.036
Abortions and fetal losses							
None						0.512	0.774
One	0.176	0.255	1.192	0.722	1.970	0.477	0.489
At least two	0.123	0.511	1.132	0.401	3.159	0.064	0.789
Previous live births							
None						0.005	0.998
One	0.010	0.208	1.009	0.669	1.522	0.002	0.960
At least two	0.016	0.262	1.016	0.606	1.703	0.004	0.940
Step 3							
Birth weight							
Normal weight						57.110	< 0.0001
Low birth weight	1.790	0.230	5.990	3.770	9.510	56.780	< 0.0001
Excessive birth weight	-0.203	0.759	0.814	0.182	3.616	0.070	0.789
At least one congenital anomaly	3.502	1.065	40.433	4.633	330.960	11.640	0.001
Gestational age							
Full term						41.567	< 0.0001
Early preterm	1.900	0.350	6.730	3.323	13.630	27.109	< 0.0001
Late preterm	-0.105	0.310	0.889	0.486	1.652	0.116	0.730
Early term	0.184	0.233	1.206	0.766	1.906	0.631	0.426
Late or post term	-0.210	0.476	0.809	0.310	2.059	0.197	0.654

Summary

Between January 1, 2015 and December 31, 2015, the weighted number of infant among Puerto Rican were 522 participants. This chapter 4 presented the results of the

investigation that examined the relationship if any between IM in the rural or urban regions of PR and how the health disparity affects the IM. In addition, the profile of the participating sample and the inferential analysis of the data regarding the association of variables and the incidence in IM were analyzed.

The next chapter presents the discussion of the results, conclusions, and recommendations for future research. There were differences in the IM, descriptive characteristics, and leading causes of infant death, including the specific causes in the neonatal and post neonatal period, between those infants of Puerto Rican. In PR, the infant characteristics associated to infant death were low birth weight, at being born at early or late preterm gestations and least one congenital anomaly.

Analyzes included the determination of the magnitude of the association of covariates such as behavioral characteristics, socioeconomic characteristics, and maternal age on infant death among infants of Puerto Rican origin. Finally, in Chapter 5, I will interpret these findings by comparing them with what has been found in the literature. Additionally, will include a section regarding the limitations of the study, will provide recommendations for future studies and the implications for positive social Change.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

In this quantitative study, I used a descriptive observational design, *N*= 522, infants' deaths from PR, to explore IM and description of infant characteristics and maternal characteristics. The dependent variable was infant death and there were several independent variables of the following groups: infant characteristics, maternal characteristics, socioeconomic characteristics, and maternal age. In order to determine the characteristics associated to IM, the analyses conducted were a bivariate test, such as a chi-square test and *OR* analysis*,* and, logistic regression.

In this chapter, I present a discussion of results, including interpretations of results, limitations to studies, implications for social change, and recommendations for action and future research. Disparities have been detected regarding IM among infants of Puerto Rican origin, and there are limited publications regarding the infant and maternal determinants on IM for this population (Gorman et al., 2006; MacDorman, 2013). Therefore, in this study I addressed this gap in the literature by determining the current factors that influence IM among infants of PR.

Leading causes of infant death were (a) disorders related to short gestation and low birth weight, not elsewhere classified; (b) congenital malformations; (c) respiratory failure; and (d) sudden infant death syndrome. The populations with the highest incidence of IM was low birth weight, 41.0% weighed 1 pounds or less, and 70% of deaths occurred in the neonatal period.

Not all premature babies are the same; there are premature babies to almost term, born between 34 and 36 weeks. About 70% of premature babies belong to this category,

and there are very premature births that occur before 34 weeks' gestation. Within premature births, there are 12% born between 32 and 33 weeks, and 10% born between 28 and 31 weeks. Only 6% are born before 28 weeks' gestation. These different categories and gestation times determine the characteristics of the newborn and help predict their survival rates. About 80% of babies born after 26 weeks of pregnancy survive. Around 95% of those born between 28 and 31 weeks have the same fate. Approximately 99% of those born between 32 and 33 weeks of birth live without major complications.

Interpretations of Findings

According to the analysis, there are data that reveal that the IM rate in Puerto Rican woman is predominated by the following causes early births and low birth weight. Among the most significant findings, most of the mothers had some level of postsecondary education, and they were 21to 30 years of age.

The risk of preterm delivery is one of the factors associated with IM and the main cause of mortality within the first month after birth (MacDorman, 2012); 6 out of 10 babies who died were born in prematurely. In addition, the median and mean gestational age of these babies suggests that many Puerto Rican babies were born before 28 weeks of gestation.

The leading causes of death are considered to be the result of preterm delivery if a baby is born before the 37th week of gestation: low birthweight, respiratory failure, and sepsis. However, there are no recent published studies on these cases. In this study, Puerto Rican infants or those who died had higher percentages of premature pregnancy

and low birth weight than live Puerto Rican infants. However, the percentage of congenital anomalies reported on the live birth certificate was remarkably low.

The results with regard to birthplace variable indicate that the sample was composed of 98.6% (n = 522) of the infants born in hospital facilities; there was also an .5% (n = 1) of the participants who reported being born at home under planification practice of home birth. PR have 67 hospital facilities; it is observed that the largest distribution of days of life was 1 day with 46 participants, followed by 2 days with 37 participants. The results regarding infants' days of age indicate that the Median is 7.83 and the *SD* was 9.347 of the infants' days of age life. The results of the distribution of infant participants for the days of life variable indicate that the sample was composed of 20.7% (n = 46) of the 1 day infant life. There also 16.6 % (n = 37) of participants who reported belonging to 2 day infant life.

Research Question 1: Is there a significant difference in the IM rate among women residing in rural areas of PR in comparison with women residing in urbans areas of PR? The result reflects the distribution of women residing urban and rural zones. There is not an observed significant difference in the IM rate among Puerto Rican women residing in rural communities in PR as compared to Puerto Rican women residing in urban areas in PR. The result of the distribution of Puerto Rican women residing in urban communities is 55.9%, followed by Puerto Rican women residing in rural communities with 44.1%. The municipality with the highest incidence of IM is San Juan City 49.9 % (North Region), followed by Ponce City 15.3% (South Region).

In comparison to the report of the PR health department for the year 2014, there is a significant difference in the percentages obtained in this study in the southern region,

44%, being greater than the northern region, 30%, of the country in relation to IM. According to NCHS (2016), rural communities also had a lower OR infant mortality (32.78) compared with small and medium urban communities (41.68) and large urban communities (40.02; NHCS, 2018).

This may be the result of the limitation of specialized services of obstetricians and pediatricians in the southern region of the country. On the other hand, since 2015 and after Hurricane Maria, the migration of specialists has been on the rise because 10% of gynecologists on the island according to the Department of Health of PR, (as cited in Institute of Vital Statistics, 2019).

For the distribution of mothers in weeks of pregnancy, that the largest distribution was 24 weeks with 31 participants, followed by 25 weeks with 26 participants. In this study, 29.7% of the mothers had a high school diploma, 68.0% were unmarried, and the median age at delivery was 21.2 years In the PR, 70.0% of infant deaths of Puerto Rican origin were preterm, and 72.5% had low birth weight. The third cause of infant death was bacterial sepsis of the newborn and respiratory distress. As infant characteristics had such an influence on IM in PR, I explored events that could influence a biological failure caused by the biological factors of the infant.

Another significant finding of this study is the average age in the population of Puerto Rican mothers. There were 22.9% of mothers between 21 and 25 years of age and 0.09% between 15 and 17 years of age. According to the results obtained, the incidence of teenage pregnancies corresponds to two participants between 15 and 17 years of age with 0.09% compared to the average or average age of 21 to 25 years of age (22.9%). IM is higher in the reproductive age of Puerto Rican women. This suggests that efforts to

reduce the IM rate should be redirected to the population at risk, according to the results of this study, to women between 21 and 30 years of age.

Limitations of the Study

This study had some limitations. Initially, the first limitation was the use of secondary data for analytical purposes. The secondary data used were incomplete and did not contain all the variables of interest (see Field, 2009). Although the variables used in this study predicted an average percentage of IM, other reasons not available in the data may be influencing infant death. On the other hand, the traditional socioeconomic variables did not reach statistical significance, suggesting that there are other social characteristics and determinants that influence, for example, data on whether they were affected by a viral syndrome during some trimester of their pregnancy. The data records do not contain this variable, but it is important to consider it in tropical countries with a high incidence in viral diseases such as dengue and Zika.

A second, limitation was a possible record of the mother's origin in the data obtained because they only considered the areas of residence of the mother and the death of the infant in any town or municipality of PR. Finally, the data provided by the Puerto Rico Department does not contain missing values, which contributed to a low percentage of cases included in the regression model. It is necessary to update the records under U.S. jurisdiction, which does provide the data of the variables.

Recommendations

The results of this study contribute to the knowledge about the determinants of IM among the Puerto Rican population and provide information related to the infant and maternal characteristics that explain infant mortality in the Puerto Rican population. To

reduce IM, it is necessary to improve quality and services of maternal and neonatal care. Most Puerto Rican women receive prenatal care during their pregnancy. The mothers of the babies who died were of adequate age and had some level of post-secondary education. Was although not an included variable, there was a high incidence in proportion of Puerto Rican women who had their children by cesarean.

Recommendations to reduce IM in the Puerto Rican population include performing a continuous evaluation of the classification levels of hospitals, based on maternal and neonatal care capabilities. It is also important to disseminate the findings related to the evaluation by levels of neonatal and maternal care of hospitals to support the decision making of public and private health systems. I also recommend develop updated data records under U.S. models and jurisdiction to add data related to important variables, such as virus history during pregnancy. In addition, I recommend creating a review committee for child deaths with the purpose of identifying gaps and improving maternal and child health care. Although the use of technological tools has increased in PR, it is necessary to develop resources that impact the population at risk tempered to the results of this study. I recommend Continuing with the campaign to promote 40 weeks of pregnancy and healthy lifestyles during pregnancy. Public health professional impact communities with training in prenatal care and CPR at any time for infants. It is also necessary develop and promote the creation of a network between hospitals to transfer pregnant women at high risk in various municipalities or regions of PR. Professional training in the prevention areas of IM and public health with the knowledge and techniques can be used to promote and support the beginning of successful breastfeeding in the prenatal and postpartum period.

Some of the recommendation of this study include: Increase the requirements for hospitals to promote and support the start of successful breastfeeding. Establish collaborative efforts with the Association of Hospitals to promote the health of pregnant women and infants. Continue the collaboration with the Peer Counselors of the WIC Program and activities of the Collaborative Promotion Group of health in the pregnant and infants. Establish legislation and policies that favor pregnant women. Establish legislation and public policy that allow the development and permanence of Gynecologists and obstetricians in the country through the development of incentives and professional improvement programs. Establish the development of specialties in the area of public and nursing health that allow the development of maternal and midwifery assistance during the period of pregnancy or labor. Establish and develop communication plan in agreements with community initiatives such as March of Dimes, Healthy Babies and Health Services Resources Administration. Finally, researchers should conduct further studies in order to continue understanding the characteristics that influence IM among those of Puerto Rican.

Implications

The results obtained of this study may be useful for the health department in PR, as well as for other countries with a similar outlook in public health professionals. The implications for social change of this study are presented using the basic functions and essential public health services as a reference. During 2016 to 2017, two situations arose that affected public health and child mortality, required the immediate and intensive action of government personnel: the Zika virus epidemic and the impact of hurricanes Irma and Maria. At the local level, as part of the efforts to prevent the spread of the virus,

the government agencies provided information during the home visits and educational activities, mosquito repellents, condoms and mosquito nets for cribs were distributed. After the hurricanes, the staff worked tirelessly identifying the needs of the infant and maternal population and linking them to various government resources or private entities available in the community. The department of vital statistics of PR indicated in a preliminary way of 2017 showing the IM rate in 6.6 per 1,000 live births, a reduction of 13.2% from 2016 (7.6 / 1,000) (See figure16). PR received the award of Virginia Appear for Leadership in Prematurity in 2016 given the reduction of premature births by 31.7% in 2015. Follow the preliminary data of vital statistics of PR in addition, in 2017 premature births remain at 11.5% (Department of Vital Statistic of PR, 2018).

The first implication for social change is up-to-date knowledge about the characteristics associated with IM among Puerto Ricans. Knowledge of the risk factors associated with IM can promote the development of structures and actions in public health in the country. On the other hand, the implication for social change is in the update, revision, results of this study will allow modifying, restructuring, redirecting, and implementing successful models in the incidence of IM in PR. Early identification can promote better management of pre-existing maternal health conditions and the development of new ones. The result of study, demonstrated essential services needed to health professionals could establish a personalized monitoring system using past maternal clinical history to anticipate possible complications in future pregnancies.

Therefore, the other implication for a positive social change is the use, by health providers and health authorities, of the information obtained from this study to develop personalized prevention activities for women with factors of risk of IM and new

development. One of the strategies to be developed is the impact on the diverse and general population, not only focusing on adolescents and young people. In addition, it allows the promotion of essential public health services such as educating, guiding, and empowering people on health issues related to maternal and child health. A social change implies a change of perspective in the role of the mother according to the profile of the population at risk.

This study has the implication of establishing the profile of the population at risk based on the results obtained, especially considering age and educational level. The above, leads to develop new strategies and methods for identification and intervention in future cases. Given that there are other possible contributing factors of IM that were not analyzed, the implications for the social change of this study is the promotion of new research on the social determinants of health and how they influence IM. In additions, another direct implication of the study is the need to establish technological and effective mechanisms in the collection of data when creating records, such as considering current risk factors to the variables. Finally, one of the most important implications of this study is to promote research and create innovative solutions to health problems, identify gaps in possible contributing factors of IM that were not analyzed, and identify the social determinants of health affecting child mortality.

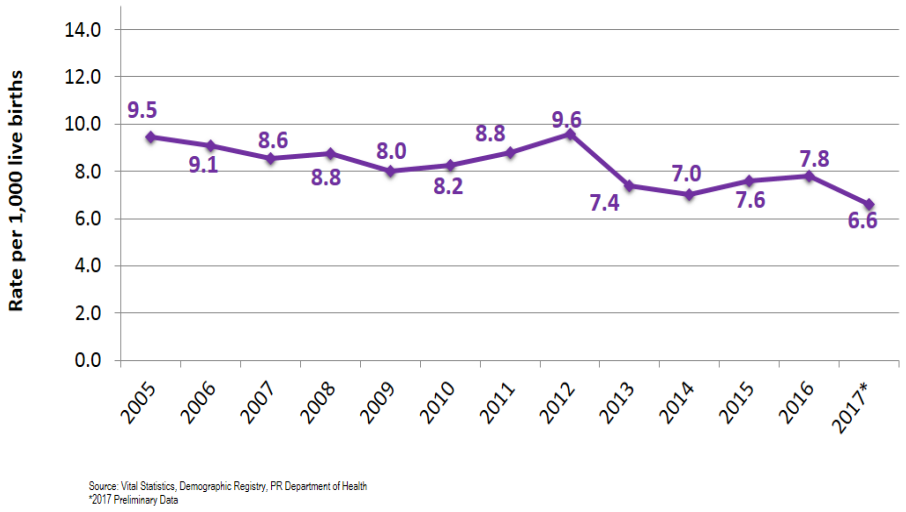

Figure 10. Infant mortality preliminary data 2017.

Conclusion

Decrease in IM is one of the objectives of this study. Detecting the health disparity between Puerto Ricans was the main objective (Mathews & MacDorman, 2013), by presenting the results of the study we contribute to the knowledge about the characteristics associated with IM among Puerto Ricans. The factors associated with infant mortality varied according to place of residence, age, and educational level. Among babies of Puerto Rican origin or the first causes of death remain attributed to premature birth and low birth weight.

The results were not statistically significant in relation to the place of residence of the mother, however there is evidence of statistical significance between some variables and co variables. Age variables predict a higher percentage of infant mortality in mothers of childbearing age. Other variables such as the level of education predict maternal characteristics with an adequate level of education for the role of mother. Despite this,

childhood characteristics predict that infants who were born prematurely between 25-30 weeks gestation were viable had it not been for low weight presented.

The variables that lost statistical significance were teenage pregnancies and women over 40 years old. None of the behavioral and socioeconomic characteristics or maternal age were statistically associated with IM in PR. Infant mortality is an important indicator of a country's health profile (Hoff et al., 2009). There is a heterogeneity of characteristics that influence IM among Puerto Ricans or who live in various regions of Puerto Rico.

Therefore, health authorities, health care providers and public health professionals could use the results of this study to develop strategies for the identification of women with risk factors associated with IM in children. Early stages of pregnancy develop personalized prevention activities and focus on preventive preconception of health care. Additional studies are required to explore the reasons behind the differences in the characteristics associated with IM and other factors such as social determinants of health.

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Appendix A: NAPHIS Approval of Data Request

GOBIERNO DE PUERTO RICO

Departamento de Salud

GOBIERNO DE PUERTO RICO DEPARTAMENTO DE SALUD

Dr. Wanda Llovet

Directora Ejecutiva

Calle Quisqueya #171
Hato Rey, PR
(787) 767-9120
(787) 763-9234

P.O. Box 11854
San Juan, PR 00917

To whom it may concern:

Demographic Registry informed that it has available the infant mortality data that you have requested and that Mrs. Maria del Carmen Medina has been provided a copy by electronic file. The same being with the intention of conducting his research Mortality Disparities Among Puerto Rican Infants (0-1) years of age 2015, as a requirement of the degree to which PhD PUBH aspires, at Walden University.

In San Juan, Puerto Rico, today July 18, 2019,

Wanda del C. Llovet Díaz
Directora Ejecutiva
Registro Demográfico de Puerto Rico

En San Juan, Puerto Rico, hoy 19 de julio de 2019.

Appendix B: IRB Approval Letter

IRB Materials Approved - Maria Del Medina

IRB <irb@mail.waldenu.edu>

Mon 7/22/2019 4:23 PM

To: Mariadel Medina <mariadel.medina@waldenu.edu>;

Cc: Raymond M. Panas <raymond.panas@mail.waldenu.edu>;

Dear Ms. Medina,

This email is to notify you that the Institutional Review Board (IRB) confirms that your doctoral capstone entitled, "Mortality Disparities Among Puerto Rican Infants (0-1) years of age 2015," meets Walden University's ethical standards. Since this project will serve as a Walden doctoral capstone, the Walden IRB will oversee your capstone data analysis and results reporting. Your IRB approval number is 07-22-19-0437866.

This confirmation is contingent upon your adherence to the exact procedures described in the final version of the documents that have been submitted to IRB@mail.waldenu.edu as of this date. This includes maintaining your current status with the university and the oversight relationship is only valid while you are an actively enrolled student at Walden University. If you need to take a leave of absence or are otherwise unable to remain actively enrolled, this is suspended.

If you need to make any changes to the project staff or procedures, you must obtain IRB approval by submitting the IRB Request for Change in Procedures Form. You will receive confirmation with a status update of the request within 10 business days of submitting the change request form and are not permitted to implement changes prior to receiving approval. Please note that Walden University does not accept responsibility or liability for research activities conducted without the IRB's approval, and the University will not accept or grant credit for student work that fails to comply with the policies and procedures related to ethical standards in research.

When you submitted your IRB materials, you made a commitment to communicate both discrete adverse events and general problems to the IRB within 1 week of their occurrence/realization. Failure to do so may result in invalidation of data, loss of academic credit, and/or loss of legal protections otherwise available to the researcher.

Both the Adverse Event Reporting form and Request for Change in Procedures form can be obtained at the Documents & FAQs section of the Walden web site: http://academicguides.waldenu.edu/researchcenter/orec

You are expected to keep detailed records of your capstone activities for the same period of time you retain the original data. If, in the future, you require copies of the originally submitted IRB materials, you may request them from Institutional Review Board.

Both students and faculty are invited to provide feedback on this IRB experience at the link below:

http://www.surveymonkey.com/s.aspx?sm=qHBJzkJMUx43pZegKlmdiQ_3d_3d

Sincerely,
Libby Munson
Research Ethics Support Specialist
Office of Research Ethics and Compliance
Walden University
100 Washington Avenue South, Suite 900
Minneapolis, MN 55401
Email: irb@mail.waldenu.edu