The Epidemiology of Infant Mortality in the Greater Newark, New Jersey Area: A New Look at an Old Problem

Natalie E. Roche, M.D., Fatimah Abdul-Hakeem, B.A., M.P.H., Amy L. Davidow, Ph.D., Pauline Thomas, M.D., Lakota Kruse, M.D., M.P.H.

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Background: The death rate during the first year of life, or infant mortality rate (IMR), is a key indicator of a nation's health. Many factors affect IMR in the United States, including race and ethnicity. The 2020 U.S. Healthy People IMR target goal has been revised to 6.0 deaths per 1,000 births. In 2006, the IMR in New Jersey was 5.5 deaths per 1,000 births, ranging from 4.4 for Caucasians, to 11.5 for African Americans.

Objective: This study is designed to determine whether IMRs vary by zip code in the greater Newark region and identify maternal/infant characteristics associated with elevated IMRs.

Methods: A descriptive study was conducted using New Jersey Department of Health (NJDOH) birth certificate data and U.S. Census data by zip code in the greater Newark area. IMRs were analyzed by zip code and by characteristics of mothers and infants.

Results: IMRs vary by zip code of residence. The lowest and highest IMRs were in zip codes 07105 and 07102, respectively, both located within the city of Newark. Maternal characteristics associated with high IMR, in multivariable analysis, include: lack of prenatal care, single marital status, and non-Hispanic black race. Demographic characteristics associated with high IMRs were: low mean household income and a large percentage of the population living below poverty level.

Conclusions: Race/ethnicity, marital status, and zip code of residence show significant impact upon infant mortality. Poverty and race/ethnicity are associated with increased IMRs and track to ZIP code.

Keywords: Infant Mortality Rate■IMR■health disparity■Healthy People 2020

Author affiliations: Natalie E. Roche, Department of Obstetrics, Gynecology and Women's Health, Rutgers New Jersey Medical School; Fatimah Abdul-Hakeem, Department of Preventive Medicine and Community Health, Rutgers New Jersey Medical School; Amy L. Davidow, Department of Preventive Medicine & Community Health, Rutgers New Jersey Medical School; Pauline Thomas, Department of Preventive Medicine and Community Health, Rutgers New Jersey Medical School; Lakota Kruse, Department of Health, Family Health Services

Correspondence: Natalie E. Roche, Department of Obstetrics, Gynecology and Women's Health, Rutgers, The State University of New Jersey, New Jersey Medical School, 185 South Orange Avenue, E506, Newark, NJ 07103, tel: (973) 972-5840, fax: (973) 972-5268, email: rochene@njms.rutgers.edu

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BACKGROUND

Infant mortality, a key indicator of a nation's health, is associated with a variety of factors that include maternal health, quality and access to medical care, socioeconomic conditions, and public health practices (i.e., health education, maternal/child health and nutrition).[1] Infant mortality rates (IMR) in the United States declined from 100 deaths per 1,000 births in the early part of the 20th century, to 6.9 deaths per 1,000 births in 2000.[1,4] This reduction was largely due to effective control of infections, improved nutrition and conceptual and technical advances in neonatal care.[2] Despite the availability of high quality neonatal care, IMR in the U.S. remain higher than in most other industrialized nations.[2,5,6] The plateau in infant mortality rate between 2000 and 2005 represented the first period since the 1950s, in which the IMR remained stagnant.[1] Regretfully, the U.S. Healthy People 2010 target goal of 4.5 deaths per 1,000 births for the IMR was not met. The Healthy People 2020 goal was subsequently revised to 6.0 deaths per 1,000 births.[3]

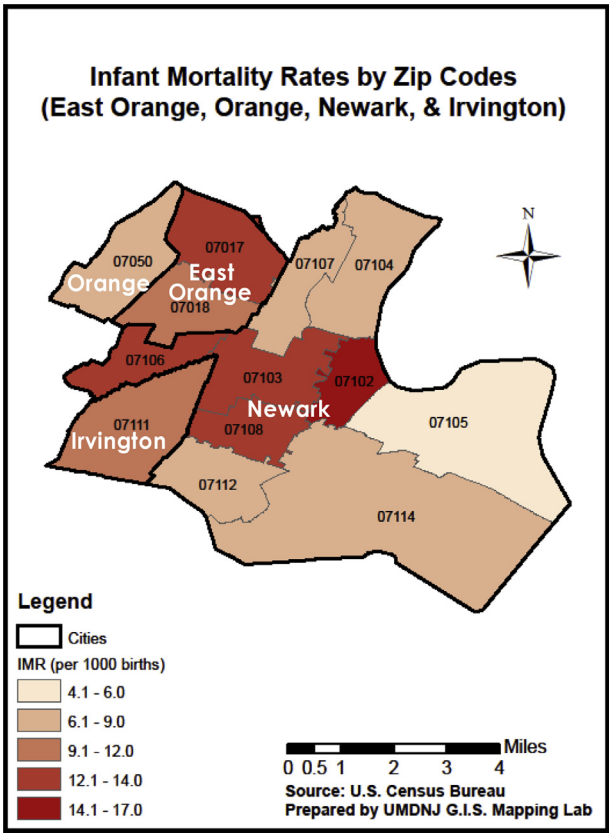
The documented variations in IMR as a function of race serve as a marker of the health disparity between African Americans and whites.[2,7,18,25,26] While the overall IMR for both races has declined, the IMR for blacks was still 2.4 times higher than for whites in 2007: 13.3 vs. 5.6 per 1,000 births.[11,27,29] The rates for Puerto Rican and Native American women were also higher than for whites, at 7.71 and 9.22, respectively.[7,8,12,20,30]

Birth weight and gestational age are important predictors of an infant's subsequent health and chance for survival.[8,9] IMRs are highest for the smallest infants and decrease sharply as the birth weight increases.[10] In 2007, IMRs were about 25 times higher for low-birth weight infants (defined as less than 2,500 gr), than for infants with birth weights of 2,500 gr or more.[8,28] The present study will examine risk factors for infant mortality in the greater Newark area, and geographic variation by zip code region.[21]

METHODS

The New Jersey Department of Health (NJDOH) has provided de-identified birth and linked death certificate data, for all births between 2000 and 2006 from the municipalities of the greater Newark region of Essex

Figure 1. Infant mortality rate by zip code, greater Newark, 2000–2006



Additional source: New Jersey Department of Health (NJDOH) for birth and linked death data in Essex County (cities of Newark, Orange, East Orange and Irvington).

County, which includes Newark, Orange, East Orange and Irvington (see Figure 1).[14,16,19] Maternal variables included race/ethnicity, maternal country of birth, education, age, marital status, gestational age at the initiation of prenatal care, and place of residence by city, state, and zip code. Infant variables included birth weight, estimated gestational age at birth, and age at death.

Data abstracted from the 2000 Census by zip code included race/ethnicity, mean household income, percent of population living below poverty level, and levels of education for individuals over 25 years of age.[13]

ANALYSIS

IMR was calculated by municipality and zip code for births between 2000 and 2006, by maternal education, marital status, maternal age, race/ethnicity, mother's birthplace (U.S. or foreign born), gestational age at the initiation of prenatal care, birth weight and gestational age at birth.

Of death certificates, 6.3% were excluded from the analysis because they were not linked to birth certificates. Using the infant birth and infant mortality linked datasets; odds ratio estimates were calculated for each variable in a bivariate analysis using the SAS 9.2 system. All variables found significant in the bivariate analysis were entered into a multivariable model. Logistic regression analysis was only conducted on data from 2000 to 2005 because of incomplete information for 2006.

For the analysis of zip code and demographic characteristics associated with IMR, the IMR was stratified as low (<6.0), medium (6–12), or high (>12).

RESULTS

There were a total of 52,608 births and 543 infant deaths between 2000 and 2006 in the four (4) municipalities (14). Table 1 shows maternal and infant characteristics. Of all mothers, 71% had a high school education or higher. Of the women who gave birth in this cohort, 68% were married. The majority of the population was non-Hispanic black (63%), followed by Hispanic (28%), non-Hispanic white (6.7%), Asian/Pacific Islander (1.2%) and unknown race/ethnicity (0.5%).

Tables 2 and 3 show the association of infant and maternal factors with IMRs. The unadjusted odds ratio is shown in Table 2 and the adjusted odds ratio in Table 3. The highest IMR occurred in those born with extremely low birth weight (i.e., less than 1500 gr [IMR=205]), or who were extremely premature (i.e., less than 32 weeks [IMR=205]).

Mothers who received no prenatal care experienced five times greater IMR than those who had initiated prenatal care in the first trimester.[17,22-24] Babies born to unmarried mothers had more than twice the average likelihood of dying during their first year of life. Babies of U.S.-born mothers had twice the usual infant mortality risk as compared to babies born to foreign-born mothers. Non-Hispanic blacks had 2.6 times greater likelihood of infant mortality compared to non-Hispanic whites. In the multivariable model, mother's race/ethnicity remained a significant predictor for infant mortality (adjusted odds ratio [OR] 2.6, CI 1.4 to 5.0) when comparing non-Hispanic blacks to non-Hispanic whites. Marital status also remained significant predictor of infant mortality. Unmarried mothers had 1.6 times higher infant mortality risk compared to married ones. Pregnant women who received no prenatal care, had higher odds of infant mortality compared with women who received prenatal care (an odds ratio of 3.9, 95% C.I. 3.0–5.2). Maternal place of birth (U.S. or outside of U.S.) and maternal education were insignificant in the multivariable analysis.