Published in final edited form as:

Matern Child Health J. 2017 July ; 21(7): 1581–1588. doi:10.1007/s10995-017-2290-3.

Disparities in Infant Mortality by Race among Hispanic and Non-Hispanic Infants

Whitney S. Rice^{a,*}, Samantha S. Goldfarb^b, Anne E. Epstein^c, Stevie Burrows^d, and Martha S. Wingate^e

^aPostdoctoral Fellow, Department of Psychology, College of Arts and Sciences, University of Alabama at Birmingham, 1300 University Boulevard, CH 215F, Birmingham, AL 35233

^bResearch Faculty I, Department of Behavioral Sciences and Social Medicine, College of Medicine, Florida State University, 1115 W. Call St., Tallahassee, FL, 32306

^cDoctoral Student and Graduate Research Assistant, Department of Health Care Organization and Policy, School of Public Health, University of Alabama at Birmingham, 1665 University Boulevard., RPHB 320, Birmingham, AL 35294

^dPopulation Health Service Fellow, University of Wisconsin School of Medicine and Public Health, 210 MLK Jr. Blvd, Rm 507, Madison, WI 53703

^eAssociate Professor, Department of Health Care Organization and Policy, School of Public Health, University of Alabama at Birmingham, 1665 University Boulevard., RPHB 310C, Birmingham, AL 35294

Abstract

Objectives—U.S.-born Hispanic infants have a well-documented health advantage relative to other minority groups. However, little published research has examined racial heterogeneity within the Hispanic population, in relation to health outcomes. The current study aims to explore possible implications of racial identification for the health of U.S. born Hispanic compared to non-Hispanic infants.

Methods—Data were drawn from 2007 to 2008 NCHS Cohort Linked Live Birth—Infant Death Files, restricted to deliveries of Hispanic black, Hispanic white, non-Hispanic black (NHB) and non-Hispanic white mothers (NHW) (n=7,901,858). Adjusted odds ratios for first week mortality, neonatal, postneonatal, and overall infant mortality were calculated for each group, using NHW as the reference group.

Results—A distinct health gradient was observed in which NHB infants (n=1,250,222) had the highest risk of first week (aOR=2.29 (2.21–2.37), neonatal (aOR=2.23, CI=2.17–2.30), postneonatal (aOR=1.74, CI=1.68–1.81), and infant mortality (aOR=2.05, CI=2.00–2.10) compared to NHW infants (n=4,578,150). Hispanic black infants (n=84,377) also experienced higher risk of first-week (aOR=1.28 (1.12–1.47), neonatal (aOR=1.27, CI=1.13–1.44), postneonatal (aOR=1.34, CI=1.15–1.56), and infant mortality (aOR=1.30, CI=1.18–1.43) compared to both NHW and Hispanic white infants (n=1,989,109).

*Corresponding Author: Whitney S. Rice, smithwd@uab.edu, Telephone: 205-975-9433.

Conclusions for Practice—Risk of infant mortality varies among Hispanic infants by race, with poorer outcomes experienced by Hispanic black infants. Compared to non-Hispanic infants of the same race, Hispanic black infants experience a smaller health disadvantage and Hispanic white infants have better or similar infant health outcomes. Our findings suggest implications of racial heterogeneity on infant health outcomes, and provide insight into the role of race as a social construct.

Keywords

Fetal; Perinatal and Infant Mortality; Ethnic and Racial Disparities; African-American Health; Latino Health; Vital Statistics

Introduction

Hispanic Americans are a diverse group, comprised of many countries of origin and multiple races (Humes, Jones, & Ramirez, 2011). Several studies demonstrate that diversity within the Hispanic population in the United States has important implications for public health research and prevention of adverse outcomes (Albrecht & Gordon-Larsen, 2013; Borrell & Crawford, 2009; Montealegre, Zhou, Amirian, Follen, & Scheurer, 2013). In particular, health outcome patterns observed for all Hispanic Americans do not fully describe the experiences of Hispanic population sub-groups. Overall, infants born to Hispanic women experience a paradoxical infant health advantage in that the rates of infant mortality, low birth weight and preterm birth for Hispanic women are similar to non-Hispanic white (NHW) women and much better than non-Hispanic black (NHB) women (Osterman, Kochanek, MacDorman, Strobino, & Guyer, 2015), despite their relative socioeconomic vulnerability (Rowley & Hogan, 2012). A closer look at these infant health indicators among Hispanic women reveals that rates of infant mortality, low birth weight and preterm birth are relatively low among Central American, South American, Cuban, and Mexican mothers, whereas Puerto Rican and Dominican mothers experience much higher rates compared to NHWs (Bediako, BeLue, & Hillemeier, 2015; Rossen & Schoendorf, 2014).

Although there is considerable research literature examining differences in health outcomes of infants born to Hispanic women by country or region of origin (Rowley & Hogan, 2012), to our knowledge, few published and peer reviewed studies have examined the implications of racial differences within the Hispanic population for infant health outcomes. Contrastingly, racial disparities in birth outcomes among the non-Hispanic population are of frequent discourse within public health, public policy, and medical journals. Black-white perinatal health differentials are perhaps most commonly discussed within the literature, and certainly the most glaring. Infants born to NHB women have persistently higher rates of infant mortality, LBW and prematurity (Osterman et al., 2015; Rossen & Schoendorf, 2014), compared to NHW women. Studies show that black-white disparities in infant health remain even among women with advantaged social positions, and when behavioral factors are accounted for (P. A. Braveman et al., 2015; Papacek, Collins, Schulte, Goergen, & Drolet, 2002). These findings in conjunction with evidence that disproves the “genetic theory of race” have informed suggestions that racial variation in other factors, such as environmental exposures, chronic stress and discrimination (Collins & David, 2009; David & Collins Jr,

2007), may contribute to these birth outcome trends through effects on epigenetic and inflammatory processes (Heather H.; Burris et al., 2014; Lu & Halfon, 2003), and support the idea that race as a social construct matters for infant health outcomes.

Most of the existing literature on infant health disparities in the U.S. has identified Hispanic ethnicity, black and white race as mutually exclusive categories, as the federal government categorizes them, despite the fact that a sizeable population classifies themselves as Hispanic black and Hispanic white (Humes et al., 2011). Few studies have explored infant health outcomes among Hispanic women by race or among black women by Hispanic ethnicity. In one study, Henry-Sanchez and Geronimus (2013) reported that black Hispanic women had significantly higher odds of infant mortality than Hispanic white women in adjusted analyses using data from 1995–1999. More recent studies found that Hispanic black women experience more advantaged birth weight outcomes than NHBs (Green, 2014), and are less likely to be born preterm or small for gestational age (Bediako et al., 2015). Taken together and consistent with the infant health disadvantage observed for NHB women compared to NHW women, it may be possible that black race is associated with infant health disadvantage regardless of ethnic background. The presence or absence of racial differences in infant health within the Hispanic population could have important social implications for infant mortality and birth weight that may be masked by current categorizations.

The current study is intended to contribute a more recent and more comprehensive exploration of the implications of black and white race for infant mortality among the Hispanic population within the United States, compared to the non-Hispanic population. Specifically, we conducted a cross-sectional study to investigate differentials in the risk of infant mortality to determine whether the racial disparity in infant mortality commonly observed for the non-Hispanic women also follows for Hispanics. Such an assessment is especially important because Hispanic Americans are the fastest growing population in the U.S. (Humes et al., 2011), and given that rates of infant mortality are indicative of population well-being and social position (Hogue & Hargraves, 1993; Yankauer, 1990). Our findings will be of interest to public health practitioners, clinicians, policymakers, and especially social science researchers interested in understanding the unique roles of race and ethnicity as they pertain to infant health outcomes.

Methods

We utilized data on infant health outcomes from the Linked Live Birth – Infant Death Cohort Files for the period 2007 – 2008 for the 50 U.S. states and Washington, D.C. The data files were requested from NAPHISIS, as the public use files did not include maternal nativity for the given years. These files include data ascertained from birth records from all states in the included years (n=8,563,959). We restricted the analyses only to include infants born to NHW, Hispanic white, Hispanic black, and NHB mothers (n=7,901,858), defined using the existing variables for self-reported race and ethnicity, thus excluding roughly 7 percent of the total population in these birth years. Additionally, we excluded records with missing data and bivariate inconsistency for gestational age and birth weight. Almost 99 percent of records (n=7,801,108) were included in the analyses, whereas we excluded 0.4 percent (n=30,266) for inconsistent birth weight and gestational age and 0.9 percent

(n=70,484) for out of range birth weight or gestational age. These specific types of observations and categories of data are excluded to prevent bias and measurement error. Procedures for determining birth weight and gestational age inconsistency have been described in detail elsewhere (Alexander, Himes, Kaufman, Mor, & Kogan, 1996).

The primary health outcomes variables examined were categorized as dichotomous variables indicating the presence or absence of first-week (<7 day), neonatal (<28 days), postneonatal (28–365 days) and overall infant mortality (<365 days). The focal independent variables incorporated in the analyses were binary maternal race and ethnic group variables for black and white race among Hispanic and non-Hispanic mothers. The descriptive variables and covariates were comprised of maternal sociodemographic and health characteristics. Age (10 – 17, 18 – 34, and 35 – 49), education (< high school vs. > high school), marital status, and maternal nativity (U.S.-born versus foreign-born) comprised the sociodemographic variables. Health characteristics were parity (low, average, or high for age) (Petersen & Alexander, 1992), smoking, hypertensive disorders (chronic and pregnancy induced hypertension), and diabetes.

The proportions of maternal characteristics and infant health outcomes were calculated by maternal race and ethnicity. Chi-square tests were performed to test whether significant racial and ethnic differences in these variables existed. We then calculated rates of first-week, neonatal, postneonatal, and infant mortality rates for the four racial and ethnic categories. Using logistic regression, we calculated odds ratios and adjusted odds ratios of each infant mortality category for each racial and ethnic group with 95% confidence intervals, using NHW as the reference group. Because mortality outcomes are rare events, the odds ratios served as estimates of risk ratios (Grimes & Schulz, 2008). All analyses were performed in SAS Version 9.3. The Institutional Review Board at the first author's institution designated the current research protocol as "not human subjects research", and thus exempt from review or approval.

Results

The distribution of live births to Hispanic mothers (n=2,073,486) revealed that roughly 4% (4.2%; n=84,377) of Hispanic births from 2007–2008 were to black mothers. Among the live births to non-Hispanic mothers (n=5,828,372) during the study period, about 21% (21.5%; n=1,250,222) were to black mothers. Table 1 provides maternal characteristics and infant mortality outcomes by race and ethnicity group. Women identifying as Hispanic were significantly more likely to be foreign born compared to non-Hispanic women ($p < .05$). Hispanic white mothers constituted the largest percentage of foreign-born (60.8%) followed by Hispanic black (53.4%), NHB (12.6%), and NHW mothers (6.0%). The highest proportion of unmarried (72%; 64.2%) and teen mothers (6%; 5.7%) was among NHW and Hispanic black women, respectively. Hispanic women had the highest proportion of less than high school education (18.1% among Hispanic white women; 10.9% among black women).

The highest proportion of mothers who were high parity for age was among NHB (4.8%). NHW women had the highest proportion of maternal smoking behavior (13.1%).

Additionally, non-Hispanic mothers were more likely than Hispanic mothers to have a hypertensive disorder. NHB women experienced the highest burden of hypertensive disorders (6.9%) followed by NHW women (5.5%) while rates of hypertensive disorders in Hispanic black and Hispanic white women were markedly lower, 4.6% and 3.3% respectively. Conversely, the prevalence of diabetes was relatively constant across racial and ethnic groups, with Hispanic women experiencing a slightly greater burden of disease than non-Hispanic women. Hispanic black women had the highest prevalence of diabetes (4.8%) while NHB women had the lowest prevalence (3.9%).

The proportions of mortality outcomes were consistently highest among the NHB group, followed by the Hispanic black group. Across all outcomes, the NHW or Hispanic white groups had the lowest rates of mortality. When infant mortality was further broken down into subcategories, the racial and ethnic disparities in mortality became even more profound. For all groups, neonatal mortality rates were between 1.5 and 2 times higher than postneonatal mortality rates. However, neonatal mortality rates of NHB women were more than double that of NHW and HW and approximately two times that of Hispanic black women.

Crude odds ratios indicate that the risk of infant mortality overall and postneonatal mortality was lower for Hispanic white (infant OR=0.96, 95% CI=0.94–0.98; PNM OR=0.88; 95% CI=0.85–0.92) compared to NHW mothers. When adjusted for maternal characteristics and risks, this protective effect disappeared and there was a slight increased risk for death prior to one year (aOR=1.07, 95% CI=1.04–1.10). There was no difference for postneonatal mortality when adjusted. For Hispanic black women, the risk for mortality in each category was roughly 20–30% greater than NHW women. The risks increased when adjusted for maternal characteristics. NHB mothers had a more than two-fold risk of mortality compared to NHW mothers with the exception of postneonatal mortality. When adjusted for maternal characteristics, the risk was not as marked with an aOR of 1.74 (95% CI=1.68–1.81).

Discussion

In this study, we investigated the relationship between race and infant mortality within the Hispanic and non-Hispanic population in the U.S. We find that the association between race and infant mortality operates similarly within the Hispanic population to that previously observed within the non-Hispanic population, in that modestly higher odds of infant mortality were observed among infants of black women. Furthermore, Hispanic ethnicity appears to have a protective effect on infant mortality regardless of race, given that Hispanic black women experience less disadvantaged odds of infant mortality than NHB women despite sharing several risk factors for adverse health outcomes. Furthermore, Hispanic white women experience better or similar odds of infant mortality to NHW women despite similar sociodemographic characteristics to Hispanic black women.

Our finding that Hispanic infants have similar risk of infant mortality compared to NHWs, and lower risk compared to NHBs has been reported previously (Rowley & Hogan, 2012). Extant literature commonly hypothesizes that this “Hispanic paradox” may be explained by protective cultural behaviors at the individual, interpersonal, and community-level,

diminished over time by acculturative processes (Fox, Entringer, Buss, DeHaene, & Wadhwa, 2015). Given that this phenomenon is evident for some Hispanic subgroups (Mexican, Cuban, Central, and South American) and not others (Puerto Rican and Dominican), social science researchers have taken interest in potential explanations for this variation. One explanation suggests that differences in racial identification and related social stratification translate into health outcomes (Henry-Sanchez & Geronimus, 2013).

The World Health Organization considers the social construct of race to be a determinant of health which underlies the inequitable distribution of resources critical to health, and whereby identifying with a marginalized racial group (i.e., in our data, black women) is associated with poorer health outcomes (Commission on Social Determinants of Health, 2010). Existing research evidence supports that the social disadvantages (economic, environmental, interpersonal, etc.) associated with being a of black race cumulatively contribute to poor birth outcomes through mediating inflammatory and epigenetic processes (Heather H.; Burris et al., 2014; H. H. Burris, Collins, & Wright, 2011; Collins & David, 2009; David & Collins Jr, 2007). For example, black women in the U.S. experience greater exposure to environmental toxicants (e.g., lead, air pollution, environmental tobacco) than white women. Chronic exposures to these toxicants can affect inflammatory processes and gene expression, which are associated with length of gestation (Heather H.; Burris et al., 2014). Additionally, repeated stress over time due to racial discrimination and other social frustrations can lead to physiological responses among women during pregnancy such as norepinephrine and cortisol output, and subsequent increased corticotrophin-releasing hormone gene expression, which can contribute to preterm birth (Lu & Halfon, 2003).

The current study also adds to the literature that racial diversity within the Hispanic population corresponds with differential odds of infant mortality; mirroring disparity within the non-Hispanic population, though smaller in magnitude. This pattern of black disadvantage in health among Hispanics has been found in prior studies of other birth outcomes (Bediako et al., 2015; Green, 2014), as well as adolescent and adult health outcomes (Borrell & Dallo, 2008; Burgos & Rivera, 2009). The consistency of this finding across the current and previous studies, which were conducted within different age groups, in different time periods, and for different outcomes, may speak to the systemic impact of the construct of race on population health in the U.S. regardless of ethnicity. These findings may be considered within the context of the large and growing body of literature suggesting that racism and related race-related social discrimination may manifest in differences in the life opportunities, exposures, and stresses which contribute to these underlying differences in health status (P. Braveman, 2014; Collins & David, 2009; Dominguez, Dunkel-Schetter, Glynn, Hobel, & Sandman, 2008).

Targeted approaches to reducing these social and structural barriers at the local level have shown promise in increasing education and building community capacity, with the long-term goal of improved infant health status (Carty et al., 2011; Frey, Farrell, Cotton, Lathen, & Marks, 2014; Kruger, Carty, Turbeville, French-Turner, & Brownlee, 2015; Kruger, French-Turner, & Brownlee, 2013). For example, the Racial and Ethnic Approaches to Community Health (REACH) program implemented community-engaged observational and educational activities to mobilize the community to address systemic determinants of health disparities,

with the aim to strengthen the maternal-infant health care system in Genesee County, Michigan. Published evaluations of REACH indicate enhanced understanding of structural determinants of health and their impact among health, professionals, and community audiences (Carty et al., 2011; Kruger et al., 2015), and improved cultural sensitivity and understanding of patient circumstances among health workers (Kruger et al., 2013). In another exemplary initiative, public health and medical leaders in Wisconsin developed a regional funding initiative with community partners to address racial gaps in birth outcomes (Frey et al., 2014), using the Life Course perspective (Lu & Halfon, 2003). To date, Wisconsin Partnership Program grantee projects have provided mental health support to pregnant women, strengthened paternal involvement during the prenatal period, and improved understanding of racism and its impact among stakeholders in the legal, health, education, and social services sectors. Continued evaluation of these programs will be needed to determine whether these approaches improve infant health outcomes, and whether they should be replicated in other locations or on a larger scale.

Findings from this study should be considered in the context of advantages and disadvantages in our approach to analysis. First, studies that use vital records data for births and infant deaths from all U.S. states allows for a representative study population, limited selection bias, and examination of health outcomes among relatively small racial and ethnic subpopulations (Schoendorf & Branum, 2006). Nonetheless, the use of administrative data has intrinsic limitations. These include the potential for missing values, out of range data, bivariate inconsistencies, and miscoding. To address this limitation, we attempted to minimize potential bias due through selection criteria designed to filter records with out-of-range birthweight or gestational age measurements or inconsistent birthweight/gestational age pairs. Although these selection criteria eliminated a very small portion of the total sample (0.4% for inconsistent values and 0.9% for out of range values) there remains the possibility that these measurements were not incorrect at random but in a more systematic manner. These data are also subject to possible underreporting of clinically relevant information. Despite these limitations, vital records data are well suited for examination of the relationship between demographic factors and pregnancy outcomes, as well as inequities in those outcomes (Schoendorf & Branum, 2006).

Another limitation of this study, inherent in our use of vital records data, is the lack of a measure of maternal economic status as an independent variable in this analysis. However, we did have access to and include maternal education in our analysis, as a measure of *socioeconomic* status that other research has found to be significantly associated with racial and ethnic disparities in infant health outcomes (Blumenshine, Egerter, Barclay, Cubbin, & Braveman, 2010). Furthermore, while prior scientific literature has suggested that disparities by race/ethnicity are attributed to economic status, contrasting research has indicated that economic status doesn't fully explain racial and ethnic disparity (P. A. Braveman et al., 2015; Lu & Halfon, 2003). Thus, the disparities observed in our study may be explained by other social factors as well. The current study also did not utilize information on health-seeking behaviors, such as prenatal care utilization (PNCU), which may account for some of the disparities found in these populations. Future studies should examine the impact of racial heterogeneity on these behaviors, given that previous literature has found significant PNCU

differences by maternal nativity and presence of a chronic condition (Goldfarb, Smith, Epstein, Burrows, & Wingate, 2016).

In summary, our analyses show patterns of white advantage and black disadvantage regardless of ethnicity in rates of infant mortality outcomes (including Day-7, neonatal, postneonatal, and overall infant mortality rates). Our findings suggest implications of racial heterogeneity within the Hispanic population on infant health outcomes, and provide insight into the role of race as a social construct.

Acknowledgments

The authors declare that they have no conflict of interest. This research was made possible through grant number T76MC00008 from the Health Resources Services Administration (HRSA), an operating division of the U.S. Department of Health and Human Services (HHS). W.S.R. is supported by a training grant in Health Services, Outcomes and Effectiveness Research (Agency for Healthcare Research and Quality T32HS013852). The contents of this publication are solely the responsibility of the authors and do not represent the official views of HRSA, HHS or AHRQ.

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Significance

Previous research has examined infant health outcomes by race and ethnicity but few studies have explored the role of race within ethnic categories. This study explores the racial heterogeneity in health outcomes within the Hispanic population compared to the non-Hispanic population in the U.S. Racial differences in mortality highlight the implications of race for adverse infant outcomes and provide insight into the role of race for the health of Hispanics in the U.S., mirroring disparities in the non-Hispanic population. These findings lend support to extant literature on the role of race as a social construct in infant health.

Table 1

Maternal Characteristics and Infant Mortality Outcomes by Race/Ethnicity of Mothers, 2007–2008 Births to U.S. Resident Mothers

Characteristics	Non-Hispanic white	Hispanic white	Hispanic black	Non-Hispanic black
N	4,578,150	1,989,109	84,377	1,250,222
Marital Status				
% Unmarried [*]	28.2%	51.4%	64.2%	72.0%
Maternal Age				
% Age 10 – 17 [*]	2.0%	5.3%	5.7%	6.0%
% Age 35 – 49 [*]	15.8%	11.3%	9.8%	10.2%
Maternal Education				
% Less than HS ^{1*}	1.5%	18.1%	10.9%	2.1%
% HS or Beyond [*]	89.1%	54.7%	66.4%	77.7%
Nativity				
% Foreign-born [*]	6.0%	60.8%	53.4%	12.6%
Parity				
% Primipara ^{2*}	42.1%	35.4%	40.4%	39.4%
% High parity-for-age ^{3*}	1.9%	3.3%	2.9%	4.8%
Maternal Health Risks				
% Smoking [*]	13.1%	1.8%	3.9%	7.2%
% Hypertensive disorder [*]	5.5%	3.3%	4.6%	6.9%
% Diabetes [*]	4.2%	4.6%	4.8%	3.9%
% Multiple Births [*]	3.8%	2.3%	2.8%	3.8%
Outcomes				
Infant mortality rate (IMR) ⁵	5.5	5.3	6.9	12.8
First-week mortality rate (FMR) ⁶	2.8	2.9	3.4	6.7
Neonatal mortality rate (NMR) ⁷	3.5	3.6	4.3	8.4
Postneonatal mortality rate (PMR) ⁸	2.0	1.7	2.6	4.4

¹ HS designates High School;

² Determined by number of previous live births on birth certificate;

³ One or more previous births for adolescents (<18), 3 or more previous births for 18–21 years, 4 or more previous births for 22–24 years, 5 or more previous births for 25 and older;

⁵ IMR: deaths <1 year * 1000;

⁶ First-week mortality: deaths <7 days * 1000;

⁷ Neonatal mortality: deaths <28 days * 1000;

⁸ Postneonatal mortality: deaths 28–365 days * 1000;

* Significant at $p < .05$.

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Table 2

Odds Ratios and Adjusted Odds Ratios for Infant Mortality Outcomes by Race/Ethnicity of Mothers, 2007 – 2008 Births to U.S. Resident Mothers

Variable	Non-Hispanic white	Hispanic white	Hispanic black	Non-Hispanic black
<i>Odds ratios</i>				
Infant mortality ¹	<i>Reference group</i>	0.96 (0.94–0.98) *	1.26 (1.16–1.36) *	2.32 (2.28–2.37) *
First-week mortality ²	<i>Reference group</i>	1.01 (0.98–1.04)	1.20 (1.07–1.35) *	2.38 (2.32–2.44) *
Neonatal mortality ³	<i>Reference group</i>	1.01 (0.98–1.04)	1.21 (1.10–1.35) *	2.36 (2.31–2.42) *
Postneonatal mortality ⁴	<i>Reference group</i>	0.88 (0.85–0.92) *	1.33 (1.16–1.51) *	2.22 (2.15–2.30) *
<i>Adjusted odds ratios⁵</i>				
Infant mortality	<i>Reference group</i>	1.07 (1.04–1.10) *	1.30 (1.18–1.43) *	2.05 (2.00–2.10) *
First-week mortality	<i>Reference group</i>	1.16 (1.11–1.21) *	1.28 (1.12–1.47) *	2.29 (2.21–2.37) *
Neonatal mortality	<i>Reference group</i>	1.15 (1.11–1.19) *	1.27 (1.13–1.44) *	2.23 (2.17–2.30) *
Postneonatal mortality	<i>Reference group</i>	0.95 (0.91–1.00)	1.34 (1.15–1.56) *	1.74 (1.68–1.81) *

* denotes statistical significance;

¹ Infant Mortality: deaths <1 year;

² First-week mortality: deaths <7 days;

³ Neonatal mortality: deaths <28 days;

⁴ Postneonatal mortality: deaths 28–365 days;

⁵ Adjusted for: Maternal marital status, age, educational status, parity, plurality, nativity, smoking, hypertensive disorders and diabetes. Cause of death data are from 99-02 due to the change in ICD coding from ICD-9 to ICD-10 in 1999.