Racial Disparities in Infant Mortality, 1990 to 2000:
Low Birth Weight, Maternal Complications and Other Causes

Abstract

Demographers have long studied the unacceptably high rates of infant mortality in the U.S., relative to other advanced countries. These higher rates are largely attributable to persistent racial gaps in infant health outcomes and are likely a reflection of social inequalities, which manifest as poorer infant health outcomes in certain groups. We extend on previous research in this area by utilizing the restricted 1990 and 2000 cohort linked birth-death files to examine the risk of infant death due to several main causes including: maternal complications, low birth weight, and other causes, and how it has changed over time. We estimate multinomial logistic regression models stratified by year to determine the likelihood of cause-specific infant death versus remaining alive. Our preliminary findings confirm an increasing black-white infant mortality gap across multiple causes of death. Further analysis will incorporate the most recent data available (2008).

Introduction

Infant mortality, typically measured as the number of infant deaths per 1,000 live births, is a key indicator of national well-being (MacDorman and Mathews 2008; World Bank 2011). Though a great deal of emphasis has been placed on reducing rates of infant mortality in the U.S., declines have been minimal and racial disparities have persisted since the 1980s. In fact, the black-white infant mortality gap has widened, with black infants experiencing significantly greater risk of death due to respiratory distress (Frisbie et al. 2004). This excess risk persists across several different causes including low birth weight (LBW), sudden infant death syndrome (SIDS), and maternal complications (Muhuri et al. 2004). Such disparities are likely a reflection of social inequality as medical advances and public health campaigns (e.g. surfactant therapy, SIDS prevention) that have reduced the rates of certain forms of infant death have not been felt evenly across different racial groups. In an effort to examine these disparities further, we use the most comprehensive data available to examine cause-specifics IMRs among different race and ethnic groups as it is necessary to consider the role of various interventions and their effectiveness across various sub-groups. Further, given the distinct regional variations in infant health, we consider how race interacts with region. Finally, we plan to incorporate the most recent data available (2008) to examine continuity in previously reported trends. Given the findings in previous related research, we offer the following hypotheses.

H1: The increasing racial gap in infant mortality will persist from 1990 to 2008.

H2: Significant interactions between region and race will be observed.

Method

For our preliminary data analysis (reported here), we use the 1990 and 2000 National Center for Health Statistics birth cohort linked birth/infant death dataset (restricted access files). Thus, we are able to examine all reported infant deaths by cause for both years. (The findings we report at the meetings will feature additional findings from the 2008 public-use linked birth-infant death data file thus allowing us to present a more recent, longitudinal analysis). Our dependent variable, cause-specific infant death, is based on these data and was constructed using ICD-9 and ICD-10 codes. We use multinomial logistic regression to model the probability of infant death due to pre-term or low birth weight; death due to maternal complications; and death due to any other cause versus the comparison group (alive = 0). We

are specifically interested in deaths attributable to maternal complications as these conditions are directly tied to maternal behaviors in many cases and are potentially reflective of disadvantage tied to race.

We consider the effects of several known covariates on infant mortality. Socio-demographic controls include maternal age (categorical: 10-18, 19-24, 25-34, 35+), education (categorical: less than high school, high school, some college and beyond), and marital status (dichotomous: married vs. non-married). Given spatial variations in infant mortality, we control for region of residence: Northeast, Midwest, South, and West (Northeast serves as the reference category). We further include race-region interactions. We consider the effects of health behaviors including alcohol and tobacco use during pregnancy. These are dichotomous variables which are coded 1 for yes and 0 for no. Finally, we control for health care utilization by including a measure of prenatal care (dichotomous: yes vs. no). Table 1 presents summary statistics for 1990 and 2000, and Table 2 presents cause-specific mortality outcomes by race and year.

We use multinomial logistic regression to model the risk of death due to the specified causes. This method allows us to determine which outcomes are more strongly patterned by race. Our results are reported as odds ratios (preliminary results shown in Tables 3a-b).

Discussion

This study examines the impact of race on cause-specific infant mortality risk across multiple time points. Preliminary analyses confirm the previously reported pattern of increasing disparity in black-white infant mortality and evidence significant race-region interactions. Our final draft will provide a full accounting of these results in addition to those for 2008. In that paper, we will discuss the implications associated with such findings, and will specify avenues for future research.

Table 1. Sample Characteristics

		1990		2000	
		Frequency	Percentage	Frequency	Percentage
Race/Ethnicity	NH White	2,630,042	64.84	2,362,987	58.84
	NH Black	661,846	16.32	604,372	15.05
	NH Other	169,308	4.17	232,682	5.79
	Hispanic	595,173	14.67	815,887	20.32
Education	<HS	920,062	23.79	866,093	21.66
	HS	1,482,917	38.34	1,273,078	31.84
	college+	1,464,501	37.87	1,858,817	46.49
Marital Status	unmarried	1,165,498	28.03	1,347,082	33.19
	married	2,992,947	71.97	2,711,821	66.81
Age categories	18-24	339,972	8.18	298,525	7.35
	19-25	1,537,813	36.98	1,404,976	34.61
	26-34	1,912,814	46	1,808,715	44.56
	35+	367,846	8.85	546,687	13.47
Region	Northeast	793,094	19.07	692,510	17.06
	Midwest	945,906	22.75	898,397	22.13
	South	1,409,390	33.89	1,487,962	36.66
	West	1,010,055	24.29	980,034	24.15
Alcohol use during pregnancy	No	2,966,778	96.69	3,448,784	99.08
	Yes	101,548	3.31	31,911	0.92
Tobacco use during pregnancy	No	2,446,057	81.56	3,063,552	87.81
	Yes	552,925	18.44	425,108	12.19
Prenatal Care	No	80,436	1.98	44,640	1.13
	Yes	3,988,122	98.02	3,905,099	98.87

Table 2. Infant Mortality Rates (IMRs) by Race/Ethnicity, 1990 and 2000

IMR	Race/Ethnicity	1990	2000	Abs. Change in Rates, 2000 to 1990
IMR (Overall)	NH White	7.188	5.649	-1.539
	NH Black	16.947	13.531	-3.415
	NH Other	7.814	5.445	-2.369
	Hispanic	7.500	5.437	-2.063
Low Birth Weight	NH White	0.591	0.723	0.132
	NH Black	2.724	2.993	0.270
	NH Other	0.577	0.773	0.196
	Hispanic	0.607	0.803	0.195
Maternal Complication	NH White	0.739	0.737	-0.002
	NH Black	1.777	1.924	0.147
	NH Other	0.494	0.600	0.106
	Hispanic	0.639	0.626	-0.014
Other Causes	NH White	5.875	4.203	-1.672
	NH Black	12.568	8.711	-3.857
	NH Other	6.758	4.084	-2.674
	Hispanic	6.270	4.021	-2.249

Table 3A. Odds Ratios of Multinomial Logit Models Predicting Infant Mortality in 1990 (N =3,759,525)

	Preterm/LBW			Maternal Complication			Other causes		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Race/Ethnicity (white = reference)									
NH Black	2.933 ***	3.651 ***	3.323 ***	1.715 ***	2.019 ***	1.916 ***	1.856 ***	1.956 ***	1.864 ***
NH Other	1.067	1.200	1.002	0.612 ***	0.583 **	0.583 **	1.224 ***	1.446 ***	1.452 ***
Hispanic	0.932	1.066	0.941	0.768 ***	0.965	0.912	0.906 **	0.987	0.929
Age Category (10-18 = reference)									
19-24	0.823 ***	0.744 ***	0.721 ***	1.118	1.072	1.057	1.029	0.970	0.956
25-34	0.957	0.804 **	0.771 ***	1.195 *	1.120	1.093	0.963	0.865 **	0.841 ***
35+	1.310 ***	1.126	1.060	1.357 ***	1.328 **	1.296 *	1.039	0.955	0.924
Education (< High School = reference)									
High Schoo	1.008	1.045	1.160 **	0.927	0.945	0.974	0.799 ***	0.798 ***	0.829 ***
Some Coll	0.885 *	0.943	1.104	0.864 **	0.878 *	0.937	0.650 ***	0.688 ***	0.729 ***
Married	0.502 ***	0.652 ***	0.756 ***	0.548 ***	0.700 ***	0.754 ***	0.632 ***	0.735 ***	0.760 ***
Region (NE = reference)									
Midwest	1.182 **	1.026	1.062	1.350 ***	1.208 **	1.272 ***	1.035	1.208 ***	1.221 ***
South	1.110 *	0.950	0.957	1.051	0.930	0.973	1.030	1.213 ***	1.208 ***
West	0.686 ***	0.656 ***	0.632 ***	1.035	1.131	1.173	0.879 ***	0.986	0.971
Alcohol Use		1.257 *	1.011		1.081	0.978		1.351 ***	1.257 ***
Tobacco Use		1.254 ***	1.161 **		1.180 **	1.174 **		1.308 ***	1.290 ***
Prenatal Care			0.125 ***			0.222 ***			0.326 ***
_cons	0.001 ***	0.001 ***	0.006 ***	0.001 ***	0.001 ***	0.003 ***	0.003 ***	0.002 ***	0.007 ***

Note: the reference category is 'alive.' *p<.05; **p<.01; ***p<.001

Table 3B. Odds Ratios of Multinomial Logit Models Predicting Infant Mortality in 2000 (N =3,949,126)

	Preterm/LBW			Maternal Complication			Other causes		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Race/Ethnicity (white = reference)									
NH Black	3.43 ***	3.58 ***	3.40 ***	2.26 ***	2.41 ***	2.28 ***	1.79 ***	1.97 ***	1.87 ***
NH Other	1.22 *	1.16	1.13	0.80 *	0.90	0.92	1.20 **	1.29 ***	1.30 ***
Hispanic	1.13 *	1.18 **	1.12	0.78 ***	0.90	0.89	0.72 ***	0.84 ***	0.82 ***
Age Category (10-18 = reference)									
19-24	0.76 ***	0.77 ***	0.74 ***	1.05	1.04	0.98	1.07	1.04	1.04
25-34	0.92	0.92	0.87 *	1.26 **	1.23 **	1.14	0.96	0.94	0.93
35+	1.00	0.98	0.90	1.34 ***	1.30 **	1.20	1.10	1.05	1.02
Education (< High School = reference)									
High Scho	1.13 **	1.15 **	1.20 ***	0.99	1.03	1.12 *	0.79 ***	0.83 ***	0.85 ***
Some Coll	0.99	1.05	1.17 **	0.80 ***	0.87 *	0.99	0.57 ***	0.63 ***	0.65 ***
Married	0.68 ***	0.69 ***	0.75 ***	0.76 ***	0.78 ***	0.81 ***	0.70 ***	0.77 ***	0.78 ***
Region (NE = reference)									
Midwest	1.51 ***	1.49 ***	1.51 ***	1.28 ***	1.29 ***	1.34 ***	1.01	1.00	1.00
South	1.16 **	1.18 ***	1.26 ***	1.07	1.11	1.14 *	1.06	1.06	1.07
West	0.90	0.92	0.92	1.03	1.30 ***	1.30 ***	1.15 **	1.12	1.11
Alcohol Use		1.62 ***	1.27		1.47 **	1.21		1.20	1.08
Tobacco Use		1.41 ***	1.34 ***		1.32 ***	1.28 ***		1.58 ***	1.56 ***
Prenatal Care			0.15 ***			0.18 ***			0.36 ***
_cons	0.00 ***	0.00 ***	0.00 ***	0.00 ***	0.00 ***	0.00 ***	0.00 ***	0.00 ***	0.00 ***

Note: the reference category is 'alive.' *p<.05; **p<.01; ***p<.001