Maternal Age and Infant Mortality for White, Black, and Mexican Mothers in the United States

By Philip N. Cohen

University of Maryland, College Park

pnc@umd.edu

Abstract

This paper assesses the pattern of infant mortality by maternal age for White, Black, and Mexican mothers, using 2013 Period Linked Birth/Infant Death Public Use File from the Centers for Disease Control. The results are consistent with the "weathering" hypothesis, which suggests that White women benefit from delayed childbearing while for Black women early childbearing is adaptive because of deteriorating health status through the childbearing years. For White women, the risk (adjusted for covariates) of infant death is U-shaped – lowest in the early thirties – while for Black women the risk increases linearly with age. Mexican-origin women show a J-shape, with highest risk at the oldest ages. The results underscore the need for understanding the relationship between maternal age and infant mortality in the context of unequal health unequal health experiences across race/ethnic groups in the U.S.

Introduction

An extensive literature addresses the relationship between maternal age and infant mortality for children by race and ethnicity in the United States (Frisbie et al. 2010). For the population overall, there is a U-shaped pattern of maternal age effects on infant mortality, with the highest risks experienced by the youngest and oldest birth mothers (Mathews, MacDorman and Thoma 2015), a pattern that is long-standing (Friede et al. 1987; Friede et al. 1988). However, analysis through the year 2002 shows that the U-shaped pattern is much less pronounced for Black women than it is for White women (Powers 2013). This is consistent with evidence on low birth-weight, which shows that for White mothers, the lowest rate of low birth-weight is in the late twenties, but for Black women the lowest risk is under age 20 and it rises monotonically with age (Love, Rankin and Collins 2010).

The "weathering" hypothesis established by Arline Geronimus suggests that White women benefit from delaying childbearing while for Black women early childbearing is adaptive because of deteriorating health status through the childbearing years (Geronimus 1996; Goisis and Sigle-Rushton 2014). This is supported by evidence of relative health deterioration for Black versus White women on, for example, measures of allostatic load (Geronimu 2006). Subsequent research suggests the weathering pattern may be seen among women of Mexican origin as well, who have higher infant mortality rates than Whites at advanced maternal ages in older data (Powers 2012).

The recent analysis by Powers (2013) uses the data through 2002, showing the Black-White gap in infant mortality gap narrowing from the 1980s through 2002, but at a stagnating pace (that analysis does not model infant mortality using health-related covariates; see below). In the last decade, the Black-White gap has narrowed further (Mathews, MacDorman and Thoma 2015). Teen birth rates have been falling since the mid-1990s, and fell especially sharply in the half-decade to 2013, as did births to women in their early 20s, part of a general trend of rising age at first birth (Martin et al. 2015). This trend has been hailed by advocates of delayed parenting (e.g., Sawhill 2014) and those who recommend delaying

births as a poverty-reduction strategy (AEI/Brookings 2015), but the impact on health disparities of remains unknown.

The purpose of this analysis is to assess the basic pattern of infant mortality by maternal age for White, Black, and Mexican-origin (hereafter, Mexican) mothers. This is the first analysis to do so using 2013 Period Linked Birth/Infant Death Public Use File from the Centers for Disease Control's (CDC) National Center for Health Statistics. The results show the continuing relevance of the weathering hypothesis, and underscore the need for understandings of the relationship between maternal age and infant mortality that recognize the unique health contexts experienced by different race/ethnic groups in the U.S.

Data and Methods

This analysis uses the 2013 Period Linked Birth/Infant Death Public Use File, which combines information from birth and death certificates (Mathews, MacDorman and Thoma 2015). The data are publicly available from the CDC at http://www.cdc.gov/nchs/data_access/Vitalstatsonline.htm. The file links at least 98% of all infant death certificates to birth certificates in every state in the U.S. In addition to maternal age, the key predictors for this analysis are race and ethnicity. I include births to mothers who are non-Hispanic White, non-Hispanic Black, and Mexican origin. Rather than include all Hispanic mothers, which masks important heterogeneity in health outcomes across Hispanic subgroups (Henry-Sanchez and Geronimus 2013), I use the largest subgroup alone.

Some key predictors of infant mortality are included in the dataset, including birth parity, smoking during pregnancy, and education level, all of which associated risk of infant mortality (Hummer et al. 1999), along with plurality (Misra and Ananth 2001). The dataset does not include such proximate determinants of birth complications as high body mass index or obesity for birth mothers (Aune et al. 2014; Johansson 2014), maternal alcohol use (O'Leary 2013), the nativity of birth mothers (Collins, Rankin and Hedstrom 2012), or their geographic location.

The analysis uses logistic regression to produce multivariate risk odds ratios for each predictor, modeled separately for White, Black, and Mexican origin mothers. I include all births to mothers with recorded values on the variables in the analysis (including Unknown, where recorded). The final sample sizes are: non-Hispanic White, 1,925,847; non-Hispanic Black, 533,341; and Mexican origin, 501,390.

The key independent variable is maternal age, coded into six categories: 12-17, 18-24, 25-29, 30-34, 35-39, and 40+. Covariates in the multivariate analysis include plurality (single birth versus twin or higher plurality), birth order (first through fifth or more), maternal education (high school or less, some college, BA or more), timing of prenatal care (began in first trimester, second trimester, third trimester, or not at all), payment source (Medicaid, private insurance, self-pay, or other), and cigarette smoking during pregnancy (no smoking versus smoking).

Results

The unadjusted infant death rates for White, Black, and Mexican mothers are presented in Fig. 1. Black women have the highest infant mortality rates, and show only a slight trend for maternal age. In contrast, White and Mexican women show pronounced U-shaped patterns, with the lowest infant mortality rates for mothers in the 30-34 age range and the highest infant mortality rates at the lowest (under 18) and highest (40+) ages.

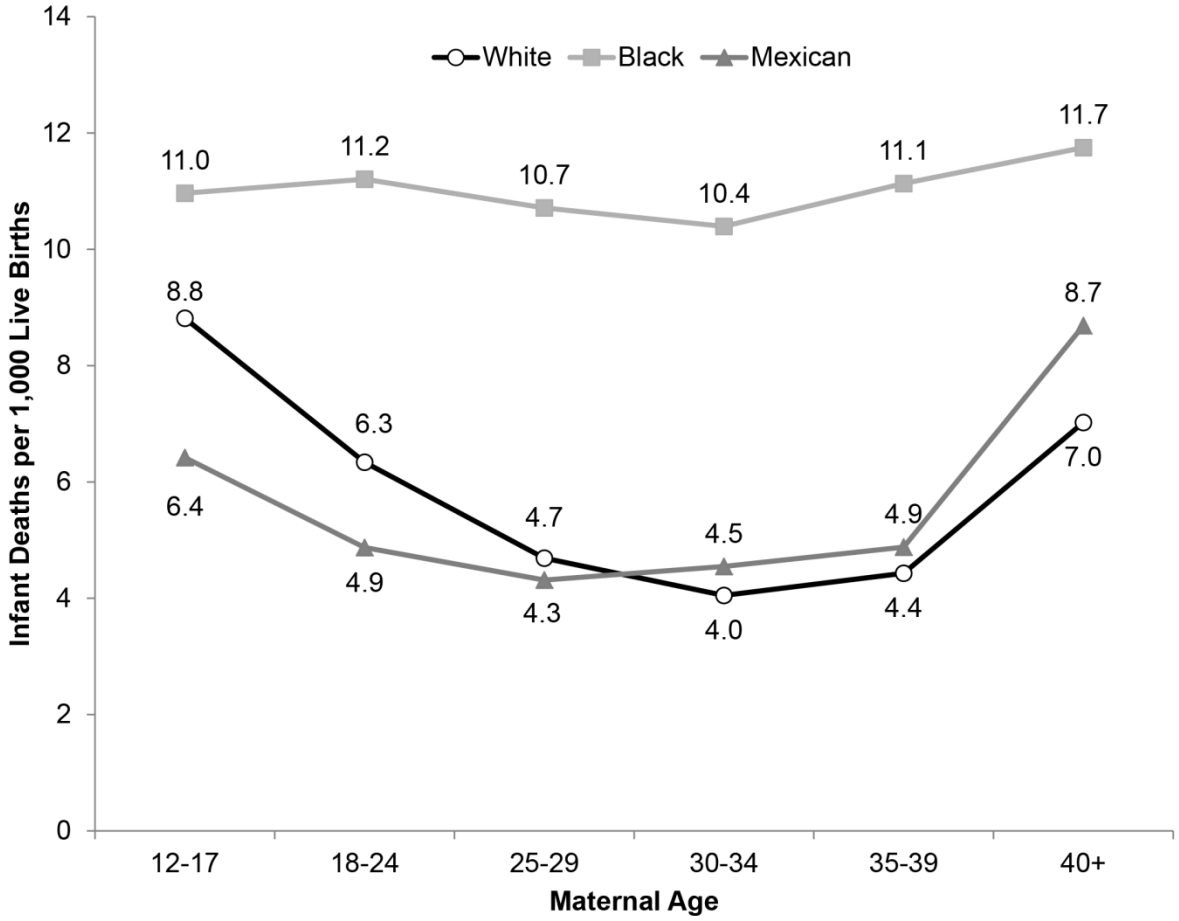

Fig. 1. Infant Death Rates, by Maternal Age: White, Black, and Mexican Mothers, U.S., 2013. Infant death rates per 1,000 live births for non-Hispanic White (*N* = 1,925,847), non-Hispanic Black (*N* = 533,341), and Mexican origin (*N* = 501,390) mothers. Data source: 2013 Period Linked Birth/Infant Death Public Use File, Centers for Disease Control.

The multivariate results are detailed in Appendix Table 1, which also includes the distributions of all covariates for each group. The main results are plotted in Fig. 2, which presents predicted probabilities of infant mortality by maternal age, estimated at the mean of the covariates for each race/ethnic group. The results confirm the U-shaped pattern of maternal age and infant mortality for White mothers, whose lowest adjusted risk is in the ages 25-39, with higher risks at younger and older ages. For Black mothers there is a linear trend of increasing risk from younger to older ages (a separate model, not shown, with a linear term for age confirms this trend is significant at conventional levels); Black mothers face a monotonically increasing adjusted risk of infant mortality as they age from younger than 18 to 40 and above. For Mexican mothers the trend takes a J-shape, as mothers age 40+ have increased risks of infant mortality.

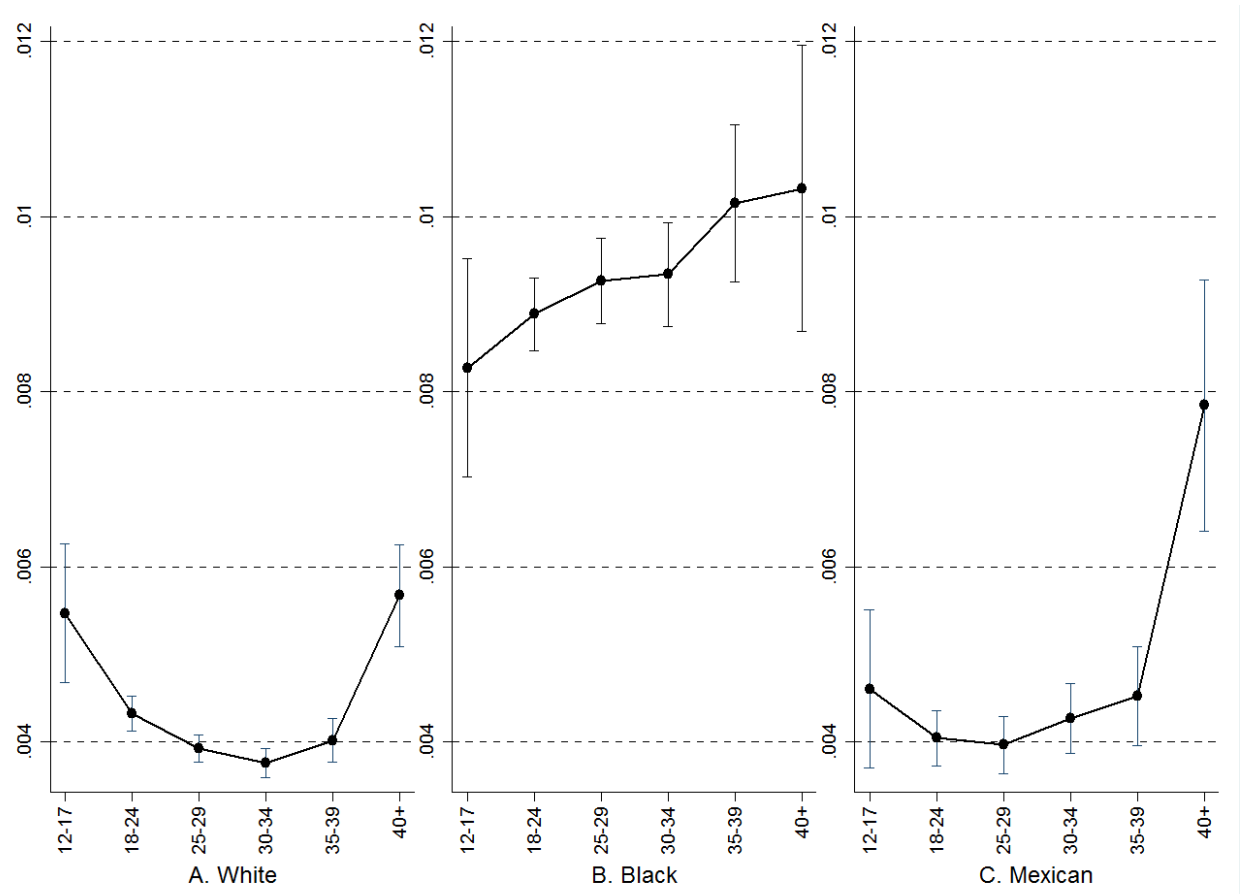

Fig. 2. Adjusted Probability of Infant Death, by Maternal Age: White, Black, and Mexican Mothers, U.S., 2013 Predicted probabilities of infant death for White (A), Black (B), and Mexican (C) mothers; models estimated separately (see Appendix Tab. 1). Predictions estimated at the mean of values for plurality, birth order, maternal education, prenatal care, payment source, and cigarette smoking during pregnancy for each race/ethnic group. Error bars are 95% confidence intervals. Data source: 2013 Period Linked Birth/Infant Death Public Use File, Centers for Disease Control.

Discussion

Unlike White women, Black women show little maternal age trend in the unadjusted rate of infant mortality. However, with controls for plurality and birth order, education, medical care and payment source, and smoking, an upward linear trend in risk emerges. With adjustments for socioeconomic and health behavior variables, this pattern presumably reflects deteriorating health conditions for Black birth mothers as they age. For Black women, then, delaying births *per se* is not associated with lower rates of infant mortality for Black women. Instead, older age is associated with increasing risk of infant mortality. The risks for Mexican women at younger ages are greatly reduced when the covariates are introduced in the multivariate model. For both Black and Mexican mothers, higher risks of infant mortality at young ages are apparently accounted for by these controls. This is consistent with some prior research on adverse birth outcomes (Dennis, Mollborn and Young 2013; Lhila and Long 2012).

Delayed childbearing is culturally expected – and medically reasonable – for Whites, but earlier childbearing may be adaptive for Black women due to deteriorating health conditions through the

childbearing years. As Geronimus notes, this makes Black women who become young mothers the targets of social scorn in a cultural and media milieu dominated by Whites (Geronimus 2003). This scrutiny is heightened by the push for "delayed, responsible childbearing," as a strategy for reducing poverty, in social policy circles (Rubin 2015). The results of this analysis are consistent with Geronimus's interpretation. The effects of maternal age on infant mortality for White women differ substantially from those of Black and Mexican women. Imposing a dominant cultural standard across all groups is not consistent with the diversity – and inequality – of underlying health patterns in the population.

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ONLINE SUPPLEMENT

Appendix Table 1. Infant Births and Deaths, by Maternal Age and Other Factors, for White, Black, and Mexican Mothers: United States, 2013

A. White	Births (N)	Deaths (N)	Percent of total	Multivariable risk (odds ratio)	(95% CI)	*P*-value
Total	1,925,847	9,598	100.0			
Maternal age						
12-17	23,144	204	1.2	1.394	(1.201 -1.619)	.000
18-24	463,649	2,939	24.1	1.101	(1.040 -1.165)	.001
25-29 (ref.)	579,490	2,718	30.1	1		
30-34	562,061	2,276	29.2	.956	(.903 -1.013)	.127
35-39	242,257	1,073	12.6	1.023	(.950 -1.101)	.544
40+	55,246	388	2.9	1.446	(1.296 -1.614)	.000
Plurality						
Single birth (ref.)	1,852,681	8,011	96.2	1		
Plurality 2+	73,166	1,587	3.8	5.664	(5.357 -5.989)	.000
Birth order						
First (ref.)	797,681	3,951	41.4	1		
Second	632,198	2,755	32.8	.841	(.800 -.884)	.000
Third	299,759	1,553	15.6	.900	(.846 -.958)	.001
Fourth	114,016	702	5.9	.959	(.880 -1.044)	.332
Fifth+	74,385	548	3.9	1.006	(.912 -1.110)	.905
Unknown	7,808	89	0.4	1.179	(.947 -1.468)	.140
Maternal education						
High school or less (ref.)	570,916	3,967	29.6	1		
Some college	600,628	2,939	31.2	.851	(.808 -.896)	.000
BA or more	744,722	2,457	38.7	.636	(.595 -.679)	.000
Unknown	9,581	235	0.5	3.185	(2.773 -3.657)	.000
Prenatal care began						
First trimester (ref.)	1,467,356	6,264	76.2	1		
Second trimester	309,274	1,707	16.1	1.080	(1.022 -1.141)	.006
Third trimester	64,686	360	3.4	1.058	(.949 -1.178)	.308
None	17,366	448	0.9	4.331	(3.912 -4.794)	.000
Unknown	67,165	819	3.5	2.452	(2.273 -2.645)	.000
Payment source						
Medicaid (ref.)	601,220	4,122	31.2	1		
Private	1,162,106	4,547	60.3	.789	(.749 -.832)	.000
Self pay	58,222	365	3.0	.948	(.849 -1.059)	.345
Other	83,185	396	4.3	.807	(.727 -.896)	.000
Unknown	21,114	168	1.1	1.099	(.937 -1.288)	.245
Cigarette use during pregnancy						
No smoking (ref.)	1,592,542	6,934	82.7	1		
Smoking	226,301	2,022	11.8	1.549	(1.466 -1.636)	.000

Unknown/NR	107,004	642	5.6	1.128	(1.038 -1.225)	.004

B. Black	Births (N)	Deaths (N)	Percent of total	Multivariable risk (odds ratio)	(95% CI)	*P*-value
Total	533,341	5,823	100.0			
Maternal age						
12-17	17,055	187	3.2	.892	(.759 -1.049)	.166
18-24	210,531	2,359	39.5	.959	(.894 -1.028)	.232
25-29 (ref.)	140,416	1,504	26.3	1		
30-34	102,753	1,068	19.3	1.008	(.930 -1.092)	.850
35-39	48,968	545	9.2	1.097	(.991 -1.214)	.075
40+	13,618	160	2.6	1.115	(.943 -1.318)	.202
Plurality						
Single birth (ref.)	512,351	4,916	96.1	1		
Plurality 2+	20,990	907	3.9	4.886	(4.538 -5.262)	.000
Birth order						
First (ref.)	199,584	2,239	37.4	1		
Second	151,817	1,494	28.5	.792	(.740 -.848)	.000
Third	92,528	935	17.3	.744	(.686 -.807)	.000
Fourth	45,160	492	8.5	.729	(.656 -.810)	.000
Fifth+	39,195	563	7.3	.826	(.742 -.918)	.000
Unknown	5,057	100	0.9	1.062	(.861 -1.309)	.575
Maternal education						
High school or less (ref.)	266,972	3,116	50.1	1		
Some college	181,990	1,859	34.1	.918	(.863 -.975)	.006
BA or more	79,185	597	14.8	.652	(.589 -.721)	.000
Unknown	5,194	251	1.0	3.539	(3.086 -4.058)	.000
Prenatal care began						
First trimester (ref.)	318,853	3,084	59.8	1		
Second trimester	129,530	1,226	24.3	.944	(.882 -1.010)	.094
Third trimester	35,641	223	6.7	.632	(.551 -.725)	.000
None	14,381	580	2.7	3.711	(3.373 -4.082)	.000
Unknown	34,936	710	6.6	1.889	(1.735 -2.058)	.000
Payment source						
Medicaid (ref.)	349,718	3,867	65.6	1		
Private	136,994	1,291	25.7	.951	(.886 -1.020)	.162
Self pay	15,343	278	2.9	1.378	(1.213 -1.565)	.000
Other	24,780	267	4.6	.943	(.832 -1.070)	.365
Unknown	6,506	120	1.2	1.290	(1.068 -1.558)	.008
Cigarette use during pregnancy						
No smoking (ref.)	459,935	4,741	86.2	1		
Smoking	35,839	581	6.7	1.474	(1.348 -1.612)	.000
Unknown/NR	37,567	501	7.0	1.088	(.989 -1.196)	.083

C. Mexican	Births (N)	Deaths (N)	Percent of total	Multivariable risk (odds ratio)	(95% CI)	*P*-value
Total	501,390	2,415	100.0			
Maternal age						
12-17	18,228	117	0.9	1.161	(.938 -1.438)	.170
18-24	170,971	833	8.9	1.019	(.911 -1.141)	.740
25-29 (ref.)	135,626	585	7.0	1		
30-34	106,676	485	5.5	1.077	(.953 -1.217)	.237
35-39	55,733	272	2.9	1.140	(.983 -1.322)	.083
40+	14,156	123	0.7	1.984	(1.623 -2.425)	.000
Plurality						
Single birth (ref.)	490,017	2,160	25.4	1		
Plurality 2+	11,373	255	0.6	5.477	(4.794 -6.257)	.000
Birth order						
First (ref.)	159,763	879	8.3	1		
Second	144,000	588	7.5	.714	(.640 -.796)	.000
Third	106,379	467	5.5	.718	(.634 -.812)	.000
Fourth	54,148	244	2.8	.675	(.577 -.790)	.000
Fifth+	35,266	212	1.8	.780	(.656 -.926)	.005
Unknown	1,834	25	0.1	1.526	(1.010 -2.308)	.045
Maternal education						
High school or less (ref.)	346,296	1,726	18.0	1		
Some college	107,432	456	5.6	.882	(.791 -.984)	.024
BA or more	41,418	163	2.2	.772	(.646 -.924)	.005
Unknown	6,244	70	0.3	1.889	(1.479 -2.412)	.000
Prenatal care began						
First trimester (ref.)	331,781	1,462	17.2	1		
Second trimester	115,293	492	6.0	.936	(.844 -1.039)	.213
Third trimester	27,248	108	1.4	.859	(.705 -1.047)	.131
None	10,979	191	0.6	3.504	(2.993 -4.103)	.000
Unknown	16,089	162	0.8	2.020	(1.708 -2.390)	.000
Payment source						
Medicaid (ref.)	308,195	1,469	16.0	1		
Private	115,909	492	6.0	.912	(.814 -1.022)	.114
Self pay	41,259	280	2.1	1.286	(1.127 -1.467)	.000
Other	30,762	140	1.6	.933	(.784 -1.111)	.438
Unknown	5,265	34	0.3	1.103	(.781 -1.559)	.578
Cigarette use during pregnancy						
No smoking (ref.)	485,110	2,266	25.2	1		
Smoking	7,209	68	0.4	1.899	(1.487 -2.426)	.000
Unknown/NR	9,071	81	0.5	1.579	(1.258 -1.981)	.000

Note: Odds ratios, 95% confidence intervals, and *p* values are from multivariate logistic regression models using all covariates shown, estimated separately by race/ethnicity. Data source: 2013 Period Linked Birth/Infant Death Public Use File, Centers for Disease Control.