Researching the rates of low birth weight and preterm birth for multiracial mothers, United States 2009

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First Reader

Second Reader
Abstract

Objective: The objective of this study is to research the rates of low birth weight and preterm birth for multiracial mothers in the United States in 2009.

Methods

This analysis uses 2009 National Vital Statistics Natality data to discover the likelihood of low birth weight and preterm birth for nine single and multi-racial categories. A logistic regression was conducted using all Non-Hispanic singleton births to United States residents, adjusting for age and education.

Results

Approximately 2% of mothers who gave birth in 2009 were multiracial. Non-Hispanic multiracial women experience low birth weight and preterm birth at rates in between that of Non-Hispanic White and Non-Hispanic Black women, the racial categories with the lowest and highest rates respectively. Education appears to be a protective factor for Non-Hispanic multiracial American Indian/Alaskan Native (AI/AN) mothers and Non-Hispanic multiracial Black mothers for low birth weight. It is a protective factor for preterm birth for Non-Hispanic multiracial AI/AN mothers but seems to increase the risk for Non-Hispanic Asian mothers.

Conclusion

A disparity for low birth weight and preterm birth rates between races persists. As the United States becomes more racially diverse, better research measurements are needed to capture race/ethnicity and other social determinants contributing to poor pregnancy outcomes.
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Introduction

One of the main goals of Healthy People 2020 is to measure, track, and eventually eliminate all health disparities using an interdisciplinary approach. Race is one of the oldest variables measured in health research, with varying levels of success. In the United States, race and ethnicity are complicated social constructs that have a heavy impact on health outcomes and health disparities.

Infant mortality is one of the most well studied racial health disparities. Although infant mortality has decreased over the past 10 years for all women, there is still a large disparity between infant mortality rates of Non-Hispanic Black mothers and Non-Hispanic White mothers. In 2005, African Americans experienced 2.3 times the infant mortality rate of non-Hispanic whites. Non-Hispanic Black mothers have the highest infant mortality of any race and ethnicity.

The top contributors to infant mortality in Non-Hispanic Black mothers are low birth weight and premature infants. Infants who are less than 5.5 pounds, or 2500 grams, at birth are considered low birth weight (LBW). LBW is also strongly correlated with premature birth. Infants born at less than 37 weeks gestation are considered premature. Seventy-five percent of Non-Hispanic Black infant deaths are due to preterm birth and low birth weight, compared to approximately 57.2% of Non-Hispanic White infant deaths. Additionally, as infant mortality has decreased, preterm birth and low birth weight rates have increased possibly due to better medical interventions preventing death. If the causes for the disparity in preterm birth and low birth weight are identified and minimized, this could potentially reduce the health disparity in infant mortality.
Age, low socioeconomic status, marital status, and risky behaviors such as smoking and drinking are a few risk factors correlated with low birth weight and preterm birth. However, when research adjusts for these risks, Black mothers still experience low birth weight and premature births at greater rates than White mothers. For example, the infant mortality rate for Non-Hispanic Black mothers with over 13 years of education was almost three times that of Non-Hispanic White mothers in 2005. Because of this discrepancy, researchers have begun looking into other possible contributing factors. Psychosocial stress is suggested to contribute to such health issues. Psychosocial stress is also a suggested reason for why multiracial adolescents are more likely to smoke, drink and participate in risky behaviors compared to their single race comrades.

Controlling for age, gender and SES, multiracial adolescents were significantly more likely than single race adolescents to smoke, drink alcohol, and smoke marijuana. An article comparing patterns in multiracial health disparities found no significant difference between multiracial youths and Black youths in marijuana use. Multiracial youths were also more likely to exhibit violent behavior than all other single race groups including Black single race adolescents of whom there is no significance difference in other behaviors. According to life course theory, risky behavior during adolescence affects later health outcomes, thus multiracial adolescents may be at risk for negative pregnancy outcomes. It has been suggested that psychosocial stressors related to the lived experience as a multiracial adolescent contributes to these disparities.
A few studies have analyzed adverse pregnancy outcomes of biracial couples, couples where each parent belongs to a different racial category.\textsuperscript{15,16} To reduce confusion, couples that are biracial (two different racial categories) shall be called bi-racial couples while multiracial indicates individuals who self-identify as more than one race. These studies found that biracial pairings experienced greater rates of stillbirth, preterm birth, and low birth weight.\textsuperscript{15,16} These studies were conducted on a state level or in clinical contexts. Only a 2007 National Vital Statistics Report looked at characteristics including preterm birth and low birth weight of multiracial mothers using 2003 Birth Records data.\textsuperscript{17} In that report, only six states reported multiple race data in 2003: California, Hawaii, Pennsylvania, Utah, and Washington. In 2009, 33 states reported multiple race data.\textsuperscript{18} This paper seeks to further the research conducted in the 2007 report and analyze the risks of preterm birth and low birth weight infants born to multiracial women in 2009. It is predicted that multiracial women will experience low birth weight and preterm birth at greater rates than single race categories with lower rates (i.e., Non-Hispanic White) and less than single racial groups who have the worst rates (i.e., Non-Hispanic Black).

\textbf{Methods}

\textbf{Sample Design}

Statistical reporting on race and ethnicity is categorized according to an Office of Management and Budget (OMB) federal mandate. Since OMB revisions to birth certificate records in 1997 and changes in the 2000 Census, which expanded the minimum number of racial categories and enables respondents to self-identity as more than one race, there is now data emerging for multiracial mothers. This study is a secondary analysis using the 2009 public
use National Vital Statistics Natality Data to determine rates of low birth weight and preterm birth for multiracial and single race mothers in the 33 states that reported multiracial data. The Centers for Disease Control and Prevention’s National Center for Health Statistics (NCHS) collects data on all registered births from all 50 states, the District of Columbia, and New York City. This study will only incorporate the 33 states that collected multiple race data. Birth record data is based on the 1989 (unrevised) and the 2003 (revised) U.S. Standard Certificate of Live Birth. In 1997, the OMB revised their race and ethnic standards to expand racial categories to a minimum of five categories and one ethnicity, and to allow people to select more than one race. This revision was adapted by the 2000 Census and is now required of all federal surveys. In 2003, the National Center for Health Statistics (NCHS) revised the US birth certificate in compliance to OMB standards. However by 2003, only six states plus the District of Columbia (DC) provided NCHS with multiple race data in accordance with the 1997 OMB revision. For the 2009 data collection year, 33 states plus DC were in compliance, accounting for 71% of US births in that year.11 In accordance with the 2003 revision, this study will report rates for the five single race categories: White, Black, American Indian/Alaskan Native (AI/AN), Asian, and Native Hawaiian and Other Pacific Islander (NHOPI). The 2009 public use Natality data reports multiracial data for four categories: White (in combination with other races), Black (in combination with other races), AI/AN (in combination with other races), and Asian and Native Hawaiian and Other Pacific Islanders (A/NHOPI) in combination with other races.

The conceptual model (Figure 1) for this analysis predicts that maternal race will affect the likelihood of low birth weight and preterm birth, and will be mediated by age and years of education.
Variable Descriptions

The outcome variables are low birth weight and preterm birth. Infants are classified as low birth weight if they are less than 2500 grams at birth. Preterm birth is classified as all births at less than 37 weeks gestation based on clinical estimation. The independent variable for maternal race only includes records from the 33 states that reported multiple race data. NCHS places respondents who report more than one race into categories using a ‘bridging’ process. For example, respondents who self-identify as Black and White would be assigned to either the category ‘Black and other race’ or ‘White and other race’. Race was recoded to report data on 9 racial categories: White, Black, AI/AN, Asian, NHOPI, White multiracial, Black multiracial, AI/AN multiracial, and A/NHOPI multiracial. The other independent variables include maternal age in years and maternal years of education as continuous variables. This analysis excludes all
foreign residents and all mothers listed as Hispanic. Only singleton births were included in this analysis.

**Statistical tests**

To calculate the odds ratio of low birth weight and preterm birth for each racial category, this analysis uses STATA 12 to conduct a logistic regression adjusting for age and years of education.

**Results**

In 2009, there were a total of 2,011,940 singleton births to Non-Hispanic mothers reported in the 33 states included in this study. Non-Hispanic multiracial mothers account for 44,631 births, approximately 2% of all singleton births to US residents of the 33 states reporting multiple race data. (Table 1 and Figure 2) Non-Hispanic white mothers had the lowest prevalence of low birth weight in 2009 (5.2%), while Non-Hispanic Black mothers had the highest prevalence (11.3%). (Figure 3) Non-Hispanic Black multiracial mothers had the highest prevalence of multiracial mothers for low birth weight with 7.9% experiencing LBW and Non-Hispanic White multiracial had the lowest at 5.2%. Approximately 6.2% of Non-Hispanic AI/AN mothers experienced LBW compared to 6.33% of multiracial AI/AN. For Non-Hispanic Asian mothers, 6.54% of births were LBW while 5.66% of Non-Hispanic NHOPI births were LBW. For Non-Hispanic multiracial A/NHOPI mothers, 6.27% of all births were LBW. (Figure 3)

Non-Hispanic White mothers had the lowest prevalence of preterm birth (8.6%) and Non-Hispanic Black mothers had the highest preterm birth prevalence (15.4%).(Figure 4) Non-Hispanic multiracial A/NHOPI had the next lowest prevalence (9.2%) while Non-Hispanic
multiracial Black mothers had the next highest prevalence (11.4%). Ten percent of Non-Hispanic white multiracial mothers experienced preterm birth. Non-Hispanic AI/AN had a higher prevalence of preterm birth (12.7%) compared to Non-Hispanic multiracial AI/AN (10.9%). Nine percent of Non-Hispanic Asian mothers had a preterm birth and 13.34% of Non-Hispanic NHOPI had a preterm birth. The prevalence for multiracial Non-Hispanic A/NHOPI preterm births was 10.3%. (Figure 4)

Next a logistic regression was conducted to analyze the likelihood of low birth weight and then preterm birth for each racial category as compared to Non-Hispanic White mothers, adjusted for age and education. Non-Hispanic Black mothers were 2 times as likely as Non-Hispanic white mothers to have low birth weight infants in 2009 (2.03 OR, 1.85-2.23 CI). The likelihood of LBW was also significant for Non-Hispanic Asian (1.83 OR, 1.69-1.99 CI), multiracial Non-Hispanic White (1.34 OR, 1.09-1.65 CI), and multiracial Non-Hispanic A/NHOPI (1.49 OR, 1.31-1.71 CI) as compared to Non-Hispanic White mothers. (Table 2)

All racial categories except Non-Hispanic multiracial AI/AN were significantly more likely to experience preterm births than Non-Hispanic white mothers. Non-Hispanic Black mothers were 1.51 times as likely as single race white mothers to experience preterm birth (1.51 OR, 1.39-1.63 CI). Non-Hispanic NHOPI were almost 2 times as likely as Non-Hispanic White mothers to experience preterm birth (1.90 OR, 1.65-2.18 CI). Non-Hispanic Asian and Non-Hispanic White multiracial mothers were 1.35 times as likely (1.35 OR, 1.25-1.45 CI) (1.35 OR, 1.15-1.59). Non-Hispanic AI/AN were 1.67 times as likely while Non-Hispanic Black multiracial
mothers were 1.47 times as likely as Non-Hispanic White mothers to experience preterm birth (1.67 OR, 1.41-1.98 CI)(1.47 OR, 1.11-1.93 CI). (Table 3)

**Conclusion**

The prevalence of low birth weight and preterm birth by race reported by the 33 states in 2009 is similar to the pattern reported by the six states in 2003. In 2003, multiracial status conveyed more risk for LBW compared for all racial categories except for Black mothers. In 2009, multiracial status conveys additional risk for LBW for Non-Hispanic White mothers. Similar to 2003, in 2009, it is single-race status that conveys more risk than multiracial status for Non-Hispanic Black mothers. AI/AN and A/NHOPI had comparable prevalence of LBW between single race and multiracial status in 2009, only separated by fractions of a percent. (Figure 3) For preterm birth, single race status for Non-Hispanic Black and Non-Hispanic AI/AN mothers conveys additional risk than multiracial status. However for Non-Hispanic White and Non-Hispanic A/NHOPI mothers, multiracial status conveys more risk. (Figure 4) This was similar in both 2003 and 2009. It is expected that as more states collect data on multiple race, this overall pattern of low birth weight and preterm birth prevalence will recur.

This analysis supports previous studies that found a disparity between Non-Hispanic White mothers and Non-Hispanic Black mothers for low birth weight and preterm birth even after adjusting for age and years of education. This is the first study to analyze the disparity between Non-Hispanic multiracial mothers and Non-Hispanic White mothers for low birth weight and preterm birth. As predicted in the hypothesis, multiracial mothers appear to experience low birth weight and preterm birth at rates between those of Non-Hispanic Black
and Non-Hispanic White mothers. All racial categories except NHOPI experience LBW at rates higher than Non-Hispanic White mothers. This difference is significant for Non-Hispanic Black (2.03 OR, 1.85-2.23 CI), Non-Hispanic Asian (1.83 OR, 1.68-1.99 CI), Non-Hispanic White multiracial (1.34 OR, 1.09-1.65 CI), and Non-Hispanic multiracial A/NHOPI (1.49 OR, 1.31-1.71 CI). It was originally expected that Non-Hispanic Black multiracial mothers would experience low birth weight and preterm birth at significantly higher rates than Non-Hispanic White mothers, similar to their single race counterpart. However education seems to be a protective factor for Non-Hispanic Black multiracial mothers as well as Non-Hispanic AI/AN multiracial mothers for LBW. (Table 2) This protection does not persist for preterm birth however, since education is protective for only Non-Hispanic AI/AN multiracial mothers as compared to Non-Hispanic White mothers. In contrast, education seems to increase the risk of preterm birth for Non-Hispanic Asian mothers. The likelihood of preterm birth becomes significant for Non-Hispanic Asian mothers only when adjusted for education (1.35 OR, 1.26-1.45 CI), and then age and education (1.35 OR, 1.25-1.45 CI). (Table 3) All other racial categories are likely to have preterm births at significantly greater rates than Non-Hispanic White mothers. (Table 3)

The results from this paper indicate that disparities between races for low birth weight and preterm birth rates continue to persist. However, race alone cannot adequately explain these differences. Neighborhood effects, socioeconomic status, community and other regional differences are likely to play vital roles in these disparities. Regional differences highly influence multiracial data since certain regions are more likely to have multiracial communities than other areas of the country. Psychosocial stress has been suggested to influence health outcomes for both Non-Hispanic Blacks as well as multiracial people. The life course perspective
theory takes into account the accumulated exposure of a woman to stress and its influence on her health and therefore the health of her child. Geronimus observed that as Black women aged they experienced negative pregnancy outcomes at increasingly greater rates than their white counterparts. She termed this phenomenon “weathering,” and theorized that it is caused by accumulated psychosocial and physical stress, such as repeated exposure to racism. Similar psychosocial stress and perceived exposure to racism could be affecting multiracial women as well.

Additionally, according to longitudinal data, maternal low birth weight or preterm birth has been shown to be associated with low birth weight and preterm birth of their offspring. Since a study found that interracial couples experience low birth weight and preterm birth at higher rates than single race couples, this can potentially have a domino effect on multiracial parents, increasing their risk of having low birth weight infants and preterm birth. It is curious that education is protective for some racial categories but not for others. Future studies comparing low birth weight and preterm birth by race should look at the rates for certain bi-racial pairings that occur most frequently such as Black-White, White-Asian, etc.

One of the limitations of this study is the way multiracial data was available in the public use 2009 Natality dataset. Multiracial data was only presented for the four categories: White in combination with other races, Black in combination with other races, AI/AN in combination with other races and A/NHOPI in combination with other races. Asian and NHOPI were combined to be comparable to an earlier birth certificate (1979) and could not be separated. The NCHS will continue to bridge persons who identify as more than one race into a single
category until all 50 states and territories comply with the 2003 OMB revisions. This limits the ability to look at data for respondents who select two or more races. Hopefully, reporting on multiple race continues to improve and this study will be recreated in the future.
References


22 Geronimus AT, Hicken M, Keene D, Bound J. “Weathering” and age patterns of allostatic load scores among blacks and whites in the United States. Am J Public Health. May 2006; 96(5):826-33
Acknowledgements

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### Table 1. Demographics

<table>
<thead>
<tr>
<th>Race</th>
<th>Sample Size N (%)</th>
<th>Low Birth Weight N</th>
<th>Preterm Birth N</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>1,432,549 (71.2)</td>
<td>74,381</td>
<td>126,772</td>
</tr>
<tr>
<td>Black</td>
<td>349,326 (17.36)</td>
<td>39,419</td>
<td>53,845</td>
</tr>
<tr>
<td>AI/AN</td>
<td>22,239 (1.11)</td>
<td>1,380</td>
<td>2,810</td>
</tr>
<tr>
<td>Asian</td>
<td>155,843 (7.75)</td>
<td>10,187</td>
<td>14,008</td>
</tr>
<tr>
<td>NHOPR</td>
<td>7,352 (0.37)</td>
<td>416</td>
<td>978</td>
</tr>
<tr>
<td>White Multiracial</td>
<td>20,895 (1.04)</td>
<td>1,342</td>
<td>2,088</td>
</tr>
<tr>
<td>Black Multiracial</td>
<td>11,551 (0.57)</td>
<td>915</td>
<td>1,315</td>
</tr>
<tr>
<td>AI/AN Multiracial</td>
<td>2,720 (0.14)</td>
<td>172</td>
<td>297</td>
</tr>
<tr>
<td>A/NHOPI Multiracial</td>
<td>9,465 (0.47)</td>
<td>593</td>
<td>969</td>
</tr>
<tr>
<td>Total</td>
<td>2,011,940 (100)</td>
<td>128,805</td>
<td>203,082</td>
</tr>
</tbody>
</table>

| Age, years (SD)     | 27.72 (+/- 6.06)  | N/A                | N/A             |
| Education, years (SD)| 14.28 (+/- 7.38)  | N/A                | N/A             |
Table 2. Odds Ratio of Low Birth Weight by Race, unadjusted and adjusted

<table>
<thead>
<tr>
<th>Race</th>
<th>LBW Unadjusted OR (95% CI)</th>
<th>Adjusted for Age OR (95% CI)</th>
<th>Adjusted for Education OR (95% CI)</th>
<th>Adjusted for Age &amp; Education OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>White (single race) was the referent group.</td>
<td>AI/AN is American Indian and Alaska Native</td>
<td>A/NHOPI is Asian/Native Hawaiian and Other Pacific Islander.</td>
<td>All odds ratios with a p-value &lt; 0.05 are in bold. (Confidence Intervals are rounded to nearest two decimals)</td>
<td></td>
</tr>
</tbody>
</table>
### Table 3. Odds Ratio of Preterm Birth by Race, unadjusted and adjusted

<table>
<thead>
<tr>
<th>Race</th>
<th>Preterm Birth</th>
<th>Unadjusted OR (95% CI)</th>
<th>Adjusted for Age OR (95% CI)</th>
<th>Adjusted for Education OR (95% CI)</th>
<th>Adjusted for Age &amp; Education OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>White</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>1.88 (1.86-1.90)</td>
<td>1.88 (1.86-1.90)</td>
<td>1.50 (1.38-1.62)</td>
<td>1.51 (1.39-1.63)</td>
<td></td>
</tr>
<tr>
<td>AI/AN</td>
<td>1.49 (1.43-1.55)</td>
<td>1.49 (1.43-1.55)</td>
<td>1.65 (1.39-1.95)</td>
<td>1.67 (1.41-1.98)</td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>1.02 (0.99-1.04)</td>
<td>1.02 (0.99-1.04)</td>
<td>1.35 (1.25-1.45)</td>
<td>1.35 (1.25-1.45)</td>
<td></td>
</tr>
<tr>
<td>NHOPPI</td>
<td>1.58 (1.48-1.69)</td>
<td>1.58 (1.48-1.69)</td>
<td>1.88 (1.64-2.17)</td>
<td>1.90 (1.65-2.18)</td>
<td></td>
</tr>
<tr>
<td><strong>White Multiracial</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>1.14 (1.09-1.20)</td>
<td>1.14 (1.09-1.20)</td>
<td>1.34 (1.14-1.58)</td>
<td>1.35 (1.15-1.59)</td>
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</tr>
<tr>
<td>Black</td>
<td>1.32 (1.24-1.40)</td>
<td>1.32 (1.25-1.40)</td>
<td>1.45 (1.10-1.92)</td>
<td>1.47 (1.11-1.93)</td>
<td></td>
</tr>
<tr>
<td><strong>AI/AN Multiracial</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI/AN</td>
<td>1.26 (1.12-1.42)</td>
<td>1.26 (1.12-1.42)</td>
<td>1.51 (0.88-2.58)</td>
<td>1.52 (0.89-2.61)</td>
<td></td>
</tr>
<tr>
<td><strong>A/NHOPI Multiracial</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A/NHOPI</td>
<td>1.18 (1.10-1.26)</td>
<td>1.18 (1.10-1.26)</td>
<td>1.53 (1.38-1.70)</td>
<td>1.54 (1.39-1.71)</td>
<td></td>
</tr>
<tr>
<td><strong>AGE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N/A</td>
<td></td>
<td>0.99 (0.99-1.00)</td>
<td>N/A</td>
<td>1.00 (0.99-1.01)</td>
<td></td>
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<tr>
<td><strong>EDUCATION</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>N/A</td>
<td></td>
<td>N/A</td>
<td>1.00 (0.08-0.083)</td>
<td>1.00 (1.00-1.004)</td>
<td></td>
</tr>
</tbody>
</table>

White (single race) was the referent group.
AI/AN is American Indian and Alaska Native
A/NHOPI is Asian/Native Hawaiian and Other Pacific Islander.
All odds ratios with a p-value < 0.05 are in bold. Confidence Intervals are rounded to nearest two decimals.
Figure 1 Conceptual Model

Maternal Race

Age

Years of Education

Preterm Birth

Birth weight

Figure 2 US Demographics

2009 US Maternal Race

- White: 69%
- Black: 16%
- AI/AN: 11%
- Asian: 1%
- NHOPi: 2%
- Multiracial: 1%
- American Indian or Alaska Native (AI/AN)

Preterm Birth (<37 weeks gestation)

Birth weight

Age

Years of Education
Figure 3. Prevalence of Low Birth Weight by Race

![Chart showing prevalence of low birth weight by race.]

- White: 5.2%
- Black: 11.3%
- AI/AN: 6.4%
- A/NHOPI: 6.5%

Legend: Blue = Single Race, Green = MultiRace

Figure 4. Prevalence of Preterm Birth by Race

![Chart showing prevalence of preterm birth by race.]

- White: 8.9%
- Black: 15.4%
- AI/AN: 12.7%
- A/NHOPI: 9.2%

Legend: Blue = Single Race, Green = MultiRace
Technical Notes

In the 2009 US Natality file, the 33 states who reported multiple race data to NCHS include:

California, Colorado, Delaware, District of Columbia (after Feb), Florida, Georgia, Idaho, Indiana, Iowa, Kansas, Kentucky, Michigan, Montana, Nebraska, New Hampshire, Nevada (after June), New Mexico, New York, North Dakota, Ohio, Oklahoma (after April), Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, Washington, Wyoming (according to the 2003 US Standard Certificate of Live Birth Standards), Hawaii, Minnesota, and Rhode Island. Hawaii, Minnesota and Rhode Island according to the 1989 revision of the US Standard Certificate of Live Birth. Of these 33 states, 1.9% mothers reported being of multiple race. Within each state, there is varying percentage with some states reporting less than 1 % multiple race (Indiana, Iowa, New Hampshire and Texas) and others greater than 36% (Hawaii).