Birthweight Outcomes among Asian American and Pacific Islander Subgroups in the United States

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Background. Information on birth outcome among the Asian and Pacific Islander populations in the US is limited. This report examines the risks of moderately low (MLBW) and very low birthweight (VLBW) among six Asian subgroups (Chinese, Japanese, Filipinos, Asian Indians, Koreans, Vietnamese) and three Pacific Islander subgroups (Hawaiians, Guamanians, Samoans) as compared with non-Hispanic whites.

Methods. Data from the 1992 US Natality File were used to calculate the percentage of MLBW and VLBW births among each Asian American and Pacific Islander subgroup. Logistic regression was used to calculate odds ratios (OR) after adjustment for maternal characteristics.

Results. VLBW OR ranged from 0.75 among Chinese to 1.59 among Asian Indians. MLBW OR ranged from 0.89 among Samoans to 2.12 among Asian Indians. Adjusted OR increased for most Asian American groups (e.g. VLBW OR = 1.89 for Asian Indians) and decreased among Pacific Islander subgroups, indicating relatively favourable risk characteristics for Asian Americans and unfavourable characteristics for Pacific Islanders. Risk of VLBW was not necessarily related to risk of MLBW. For instance, the VLBW OR among Japanese was 1.07, compared to an MLBW OR of 1.47.

Conclusions. Marked heterogeneity in birthweight outcome was observed between Asian American and Pacific Islander subgroups. This heterogeneity was not related to traditional demographic risk factors. Additionally, risks of VLBW and MLBW were not always related. These findings suggest that the Asian American and Pacific Islander populations should not be aggregated into a single category, and that traditional measures of risk and birth outcome may not be valid for those groups.

Keywords: low birthweight, birth outcome, Asian, Pacific Islander, Asian American

Asian Americans and Pacific Islanders are among the fastest growing and most diverse populations in the US. The Census Bureau reported a 99% increase in the Asian American population and a 44% increase in the Pacific Islander population between 1980 and 1990.1,2

Low birthweight (<2500 g) is a major predictor of infant morbidity and mortality.3 Information on birthweight outcomes in the Asian American and Pacific Islander (AA/PI) population has been limited, especially with regard to specific ethnic groups. Previous studies on birthweight outcomes in the AA/PI population have concentrated on the few subgroups for which data were available, mainly Chinese, Japanese, Filipino, and Hawaiian. The findings of these studies suggest that Asian Americans and Pacific Islanders are a heterogeneous group with regard to maternal risk factors, birthweight and infant mortality outcomes.4-9

Other AA/PI subgroups are often grouped together as a single entity (‘unspecified or other AA/PI’) despite the fact that they account for more than half of the AA/PI population and encompass subgroups with distinct socioeconomic and cultural characteristics.1-2

In most previous studies of AA/PI ethnicity and birthweight, low birthweight (<2500 g) was the only birthweight category examined. Dividing low birthweight into components, such as very low birthweight (<1500 g) and moderately low birthweight (1500–2499 g), provides a more complete understanding of their influence on infant health. Very low birthweight (VLBW) infants are primarily preterm and have the highest risks of morbidity and mortality.10 In contrast, the moderately low birthweight (MLBW) group is a mixture of preterm infants, small-for-gestational-age term infants and appropriate-for-gestational-age term infants, and has a markedly lower infant mortality rate than the VLBW group.11

The AA/PI population in the US population is growing rapidly, and this growth is largely due to
immigration. The comparison of birth outcomes among foreign-born and US-born mothers may provide further understanding of determinants of poor outcomes in ethnic groups such as the Chinese, Asian Indians, Koreans, and Vietnamese. There have been several reports of better pregnancy outcomes in foreign-born compared to US-born mothers in the black and Hispanic populations.\textsuperscript{12-15} However, in a previous study on Filipino infants born in Hawaii, better outcomes were not observed for births to foreign-born mothers.\textsuperscript{16}

According to the 1990 US census, the six largest AA subgroups are Chinese, Japanese, Filipino, Asian Indian, Korean, and Vietnamese which account for 89% of the AA population. The three largest PI subgroups are Guamanian, Hawaiian and Samoan which account for 89% of the PI population. In this paper, we focus on these six AA and three PI subgroups. Distributions of maternal risk factors and risks of MLBW and VLBW for each subgroup are compared to non-Hispanic whites. We also report on MLBW and VLBW risks among US-born as compared to foreign-born mothers of AA subgroups.

**DATA AND METHODS**

We used data from the 1992 National Natality File,\textsuperscript{17} which contains information from birth certificates compiled by the National Center for Health Statistics. We included singleton births to US residents who were identified as belonging to any of six AA subgroups (Chinese, Japanese, Filipinos, Asian Indian, Korean, Vietnamese), or any of three PI groups (Hawaiian, Guamanian, Samoan). In addition, in some analyses, we used singleton births to non-Hispanic white US residents as a reference group.

Our analyses were limited to residents of the following seven states: California, Hawaii, Washington, Texas, Illinois, New Jersey and New York. Prior to 1992, only four AA/PI subgroups were reported in the National Natality File: Chinese, Japanese, Filipino and Hawaiian. Since 1992, additional AA (Asian Indian, Korean, Vietnamese) and PI (Guamanian, Samoan) subgroups have been reported in the National Natality File in the above seven states. A majority of AA and PI in the US reside in these states. For AA/PI subgroups that were reported in all 50 states and the District of Columbia (Chinese, Japanese, Filipinos, and Hawaiians), these seven states accounted for 78% or more of each subgroup’s births in the country (Table 1). For the groups with data from only the seven states (Koreans, Asian Indians, Vietnamese, Guamanians and Samoans), data from the 1990 Census\textsuperscript{18} showed that these states accounted for 62–84% of each subgroup’s total population in the US (Table 1). It should be noted that Samoans and Guamanians in this study were state residents of the seven-state reporting area, and did not include those who lived in American Samoa and Guam, which are US territories. For non-Hispanic whites, although the seven states only accounted for 31% of all births in the country, patterns of maternal characteristics of this group were similar to those of non-Hispanic whites in the US (data not shown).

The dependent variables in this study were very low birthweight (VLBW, <1500 g), and moderately low birthweight (MLBW, 1500–2499 g). We used multiple logistic regression to evaluate the birthweight outcomes of each AA/PI subgroup compared to non-Hispanic whites, and to evaluate the effect of mother’s country of birth (maternal nativity, categorized as US-born and foreign-born) on birthweight outcomes in each AA subgroup.

The covariates included in the logistic models were maternal age (<18, 18 and 19, 20–29, ≥30 years), education (<12, 12, 13–15, ≥16 years), marital status, parity (1st, 2nd and 3rd, 4th and higher), and antenatal care (began in the first trimester of pregnancy, later during the pregnancy, or none).

The analyses of mother’s country of birth did not include the Guamanian, Hawaiian, and Samoan subgroups because the large majority of women giving birth in this population were born in the US or the US territories, which are part of the US.
TABLE 2 Percentage distribution of births, by selected maternal characteristics, birthweight, and race/ethnicity*

<table>
<thead>
<tr>
<th>Maternal characteristics</th>
<th>Birthweight</th>
<th>Moderately low</th>
<th>Very low</th>
<th>1500–2499 g</th>
<th>&lt;1500 g</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>&lt;18 30+</td>
<td>&lt;12 16+</td>
<td>Unmarried</td>
<td>Late or none</td>
<td>1st</td>
</tr>
<tr>
<td>(Total)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100%</td>
</tr>
</tbody>
</table>

Asian Americans:
- **Chinese**: (19 147)
  - 0.2 60.5 14.9 41.4 5.6 18.1 42.6 7.8 90.4
  - 3.8 0.5
- **Japanese**: (7201)
  - 0.9 64.6 2.4 46.5 10.4 14.5 38.7 11.0 45.6
  - 5.2 0.7
- **Filipino**: (24 120)
  - 2.0 47.6 8.5 35.3 17.7 23.3 38.5 12.3 84.9
  - 5.8 1.0
- **Asian Indian**: (8984)
  - 0.4 39.4 8.0 45.0 8.1 22.7 42.9 8.6 94.9
  - 7.3 1.1
- **Korean**: (8682)
  - 0.3 48.7 4.5 40.9 4.2 26.1 40.7 8.9 97.3
  - 3.1 0.7
- **Vietnamese**: (10 711)
  - 1.5 42.1 34.7 12.9 19.3 24.3 37.8 16.3 99.2
  - 4.2 0.7

Pacific Islanders:
- **Guamanian**: (561)
  - 8.2 22.6 22.6 7.7 34.6 36.2 32.8 18.5 na
  - 5.7 0.7
- **Hawaiian**: (5397)
  - 7.2 21.6 18.2 7.5 46.6 35.9 27.4 25.0 na
  - 3.1 0.9
- **Samoan**: (1659)
  - 3.2 24.7 17.8 4.5 36.3 55.3 28.3 28.7 na
  - 3.2 0.7

Whites, non-Hispanic: (762 504)
- 2.5 41.0 11.6 27.8 17.0 16.5 33.7 15.8 7.1
  - 3.6 0.7

Late antenatal care is defined as care begun after the first trimester of pregnancy.
na = not applicable.

RESULTS

Among the AA subgroups, Filipinos had the largest proportion of births (31%), followed by Chinese (24%), Vietnamese (14%), Asian Indians (11%), Koreans (11%) and Japanese (9%) (Table 2). Among the PI subgroups, Hawaiians had the largest proportion (71%), followed by Samoans (22%) and Guamanians (7%). Eighty-six per cent of Hawaiian infants in the study population were born in Hawaii. Note that our analyses did not include the category 'other Asian Americans and Pacific Islanders', which was the aggregate of all other subgroups and comprised 11% of the total AA/PI population.

Maternal Demographic Characteristics

The demographic characteristics of the AA and PI mothers varied considerably compared to each other and compared to non-Hispanic white mothers (Table 2). For instance, the percentage of AA mothers completing <12 years of education ranged from 2.4% among Japanese mothers to 34.7% among Vietnamese mothers, compared to 11.6% among non-Hispanic whites. In general, except for Vietnamese mothers, AA mothers had relatively favourable demographic characteristics, with relatively low proportions of births to young mothers, mothers with <12 years of education, and unmarried women. AA mothers, except for Vietnamese mothers, were also more likely to have completed at least 16 years of education than their non-Hispanic white counterparts. Conversely, PI had high proportions of births to young mothers, mothers with low educational attainment, and unmarried mothers. The PI subgroups all had very low proportions of women with ≥16 years of education.

Despite the general favourable risk profiles among AA mothers, all AA subgroups except for the Japanese were more likely to initiate antenatal care after the first trimester than were non-Hispanic white mothers. Similarly, the PI populations had high proportions of late or no antenatal care. Over 50% of Samoan mothers started antenatal care after the first trimester or had no antenatal care at all.

Low Birthweight

Among AA subgroups, MLBW proportions varied from 3.1% among Korean infants to 7.3% among Asian Indians (Table 2). VLBW proportions ranged from 0.5% (Chinese) to 1.1% (Asian Indian). Among the PI subgroups, MLBW proportions ranged from 3.2% among Samoan infants to 5.7% among Guamanian infants. VLBW proportions ranged from 0.7% (Guamanian and Samoan) to 0.9% (Hawaiian).
Table 3 Logistic regression analysis on birthweight outcomes: Asian American and Pacific Islander subgroups compared to non-Hispanic Whites

<table>
<thead>
<tr>
<th>Non-Hispanic White</th>
<th>Very low birth weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Odds ratio (95% confidence interval)</td>
</tr>
<tr>
<td></td>
<td>Crude</td>
</tr>
<tr>
<td>Chinese</td>
<td>1.06  (0.98–1.14)</td>
</tr>
<tr>
<td>Japanese</td>
<td>1.47  (1.32–1.63)</td>
</tr>
<tr>
<td>Filipino</td>
<td>1.68  (1.59–1.77)</td>
</tr>
<tr>
<td>Asian Indian</td>
<td>2.12  (1.96–2.30)</td>
</tr>
<tr>
<td>Korean</td>
<td>0.85  (0.75–0.96)</td>
</tr>
<tr>
<td>Vietnamese</td>
<td>1.19  (1.09–1.31)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Pacific Islanders:</td>
<td></td>
</tr>
<tr>
<td>Guamanian</td>
<td>1.63  (1.14–2.33)</td>
</tr>
<tr>
<td>Hawaiian</td>
<td>1.45  (1.28–1.63)</td>
</tr>
<tr>
<td>Samoan</td>
<td>0.89  (0.68–1.17)</td>
</tr>
</tbody>
</table>

Demographic risk was not necessarily related to risk of VLBW or MLBW. For instance, Asian Indian mothers had favourable demographic profiles but high risks of VLBW (1.1%) and MLBW (7.3%). Conversely, Samoan mothers had high risk profiles but low proportions of VLBW and MLBW births. Additionally, the risks of VLBW and MLBW were not necessarily related. Korean and Japanese infants had the same risk of VLBW (0.7%) but markedly different risks of MLBW, 3.1% and 5.2% respectively.

Table 3 shows the results of logistic regression models in the form of odds ratios (OR) for MLBW and VLBW. OR were adjusted for maternal age, marital status, education and parity. The addition of antenatal care to the models yielded similar results; only the results without antenatal care are presented. Relative to non-Hispanic whites, crude OR for MLBW in the Asian American subgroups varied from 0.85 (Korean) to 2.12 (Asian Indian). For VLBW, crude OR ranged from 0.75 (Chinese) to 1.59 (Asian Indian). Among subgroups that had preferential maternal risk factors relative to non-Hispanic whites (Chinese, Japanese, Filipino, Asian Indian and Korean), adjustment for maternal risk factors increased the OR for poor birthweight outcomes. For the Vietnamese subgroup, which had unfavourable maternal characteristics, adjustment for risk factors had the opposite effect, i.e. decreased the relatively high OR for MLBW and VLBW.

Compared with non-Hispanic whites, crude OR for MLBW in the PI subgroups ranged from 0.89 (Samoan), to 1.63 (Guamanian). Crude OR for VLBW varied from 0.96 (Samoan) to 1.26 (Guamanian). Since all PI subgroups had unfavourable risk profiles, adjustment for risk factors lowered further the relatively low OR for MLBW and VLBW in Samoan infants, and decreased the relatively high OR among Hawaiians and Guamanians.

To determine whether sociodemographic variables had different relationships to birthweight outcomes in the various AA/PI subgroups and in non-Hispanic whites, two-way interactions between ethnicity and each of the sociodemographic factors (maternal age, marital status, maternal education, parity and antenatal care) were added in a stepwise fashion to the multivariate analyses of MLBW and VLBW. In the analysis of MLBW, we found a statistically significant ($P < 0.05$) interaction between ethnicity and maternal education, indicating different relationships between education and MLBW among different ethnic groups. An illustration of this phenomenon is shown in Figure 1, which depicts proportions of MLBW by education level among non-Hispanic whites and in each AA subgroup. For non-Hispanic whites, the proportions of MLBW infants decreased monotonically as education levels increased. This pattern of a consistent decrease in MLBW associated with increasing educational attainment was not
observed in Chinese, Japanese, or Vietnamese mothers. The relationship between MLBW and maternal education among the three PI subgroups was similar to that among non-Hispanic white infants (data not shown).

Maternal Nativity
A large proportion of the AA mothers were foreign born (Table 2). The proportions varied from 46% in Japanese mothers to more than 90% in the remaining subgroups, of which the Vietnamese had the highest proportion (99%).

Table 4 shows the results of logistic regression analyses in which odds of MLBW and VLBW for foreign-born compared to US-born mothers were calculated for four ethnic groups. OR were adjusted for maternal age, marital status, education and parity. The addition of antenatal care as a covariate to the models yielded comparable results; only the results without antenatal care are presented. We did not include any Asian subgroup that had 95% or more in its proportion of foreign-born in our nativity analysis due to the small sample size of its native-born category.

Among the groups included in the analysis (Chinese, Japanese, Filipino and non-Hispanic Whites), there was a difference in birthweight outcome by maternal nativity only among the Chinese population. Foreign-born Chinese mothers had a better outcome in MLBW than their native-born counterparts (adjusted OR = 0.79, CI = 0.43–1.52). For VLBW, Chinese foreign-born mothers also had a lower risk (OR = 0.81, CI = 0.43–1.52) than their native-born counterparts; it is...
important to note that the results for VLBW were based on small numbers.

DISCUSSION
In this study, we examined maternal characteristics among the nine largest subgroups of AA and PI in the US. Our study showed that maternal risk factors in AA/PI subgroups not only differed considerably from non-Hispanic whites, but also varied widely among subgroups. Our data on maternal characteristics were consistent with earlier studies that examined nationally representative populations of a few AA/PI subgroups (Chinese, Japanese, Filipino, Hawaiian).\textsuperscript{5,6,7}

Compared to non-Hispanic whites, maternal risk characteristics among Asian American subgroups, ranged from relatively low risk (Chinese, Japanese, Korean, Asian Indians) to high risk (Vietnamese). Japanese, Korean, and Asian Indian mothers had low percentages of adolescent mothers, high educational attainment, and low percentages of unmarried mothers and of 4th-or-higher order births. Chinese mothers had a pattern similar to these ‘low risk’ groups, except that they were slightly more likely to have <12 years of education than non-Hispanic whites. The Vietnamese, who have immigrated to the US relatively recently, had a higher risk profile than non-Hispanic whites for most of the maternal characteristics.

All AA subgroups shared several maternal characteristics, including low percentages of adolescent mothers and high proportions of first-order births. Of particular concern are the relatively high proportions of mothers who had late or no antenatal care among all AA/PI subgroups, except Japanese.

Except for having lower percentages of older and primiparous mothers, all PI subgroups had high risk profiles compared to non-Hispanic whites. Thus, the PI subgroups had higher proportions of adolescent mothers, lower maternal education attainment, higher percentages of 4th-or-higher order births, and higher proportions who received antenatal care after the first trimester.

Additionally, our results demonstrate that most differences in VLBW and MLBW among the AA/PI subgroups could not be completely explained by maternal risk profiles. Despite their low maternal risk profiles, the Asian Indian and Filipino subgroups had markedly higher risks of both MLBW and VLBW, and the Japanese group had a moderately higher risk of MLBW than non-Hispanic whites. Conversely, despite their high maternal risk profile, the Samoan group had a lower risk of MLBW. Compared to non-Hispanic whites, the Vietnamese group had a high risk of MLBW. This was explained entirely by their higher sociodemographic risk profile; the crude OR of 1.2 was reduced to 1.0 after adjustment for maternal factors.

Contrary to expectations, women with the lowest educational levels did not have the highest risks of MLBW in the Chinese, Japanese or Vietnamese groups. Educational attainment and other socioeconomic indicators have been considered to be surrogates for many factors—biological, medical, behavioural, and environmental—which may directly influence pregnancy outcomes. In several studies, smoking, which is known to be directly related to low birthweight, was more common among mothers who had <12 years of education.\textsuperscript{19,20} Smoking could not be evaluated in our study, since smoking was not reported on birth certificates in California and New York. It is unknown how health behaviour and medical factors are influenced by education and other sociodemographic risk factors in Asian American subgroups. The atypical effect of education in this population warrants further investigation.

In our analysis of maternal nativity in Chinese, Japanese, and Filipino subgroups, only Chinese US-born mothers had better outcomes for MLBW and VLBW than their foreign-born counterparts. Maternal nativity had no significant association with poor birthweight outcomes in the Japanese and Filipino groups. Few studies have looked at nativity among Asian subgroups. Studies of Filipinos and Koreans in Hawaii\textsuperscript{9,16} reported no significant association between maternal nativity and pregnancy outcomes. These findings are in contrast with previous investigations of black and Mexican Americans, who have been reported to have better pregnancy outcomes for foreign-born mothers relative to their US-born counterparts.\textsuperscript{12-15}

Our data raise several issues relevant to future research and public health policy. First, for the AA/PI subgroups examined, high rates of MLBW were not necessarily linked with high rates of VLBW, an outcome known to be strongly associated with infant morbidity and mortality.\textsuperscript{10} As mentioned in the introduction, most previous analyses of AA/PI subgroups have used the summary measure LBW as an indicator of poor pregnancy outcomes; LBW (<2500 g) is the sum of MLBW (1500–2499 g) and VLBW (<1500 g). The observed discordance between MLBW and VLBW in our analyses, or between LBW and VLBW, suggests that LBW may not be a meaningful category for the assessment of poor birthweight outcomes among the AA/PI groups. Until a more comprehensive understanding of infant morbidity and mortality can be formulated among the AA/PI subgroups, the use of VLBW may be more appropriate in the evaluation of poor birthweight outcomes. Second, the observed heterogeneity of the
AA/PI subgroups suggests that the current practice of examining the remaining AA/PI subgroups, as a single group should be re-examined. Third, all subgroups of this study population had relatively high percentages of mothers with inadequate antenatal care, despite low-risk maternal sociodemographic characteristics in some groups, confirming previous reports of low utilization of health care by the AA/PI population. These findings demonstrate that a full understanding of the diverse characteristics and health needs of individual ethnic subgroups is necessary to address issues related to maternal and child health among Asian Americans and Pacific Islanders.

REFERENCES


(Revised version received March 1996)