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# Prevalence of Obesity among Young Asian-American Children

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## Abstract

**Background:** Asian-American children are considered to be at low risk of obesity, but previous estimates have not distinguished between children from different Asian countries. We estimate the prevalence of obesity among Asian-American children by mother's country of origin, generational status, and family socioeconomic factors using a secondary analysis of the Early Childhood Longitudinal Study–Birth Cohort (ECLS-B) wave III (children ~4 years old) dataset.

**Methods:** The ECLS-B is a nationally representative study of children born in 2001 that oversampled births to Asian mothers. Asian ethnic categories included Chinese, Japanese, Filipino, Asian Indian, Korean, Vietnamese, and Other Asian/Pacific Islander. The primary outcome variable was weight status; overweight = BMI  $\geq 85^{\text{th}}$  and obese = BMI  $\geq 95^{\text{th}}$  percentile for age and gender.

**Results:** Twenty-six percent [95% confidence interval (CI) 23.6–29.1] of Asian-American 4 year olds were overweight or obese, and 13% (95% CI 10.2–15.2) were obese. Chinese-American children were at lower risk of overweight or obesity (23.5%, 95% CI 18.4–29.5) compared to whites (36%, 95% CI 34.3–37.7); Asian-Indian 4 year olds had the lowest rates of overweight or obesity (15.6%, 95% CI 8.0–28.2) and were most likely to be underweight (10%, 95% CI 4.9–19.4). Among Asians, Vietnamese-American children had the highest rate of overweight or obesity (34.7%, 95% CI 0.6–52.3).

**Conclusions:** Vietnamese-American children are at elevated risk of obesity and overweight, whereas Chinese and Asian-Indian children are at low risk. After controlling for Asian ethnicity, maternal education, and household poverty status, Asian-American children whose mothers were born outside the United States were less likely to be obese [odds ratio = 0.55 (0.32–0.95),  $p = 0.03$ ].

## Introduction

When considered as a group, Asian-American children are at lower risk of being overweight and obese than other racial and ethnic groups in the United States, including whites, African Americans, Hispanic Americans, and Native Americans.<sup>1-3</sup> There may, however, be important variability in childhood obesity rates among Asian-American ethnicities, considering that the “Asian-American” or “Asian/Pacific Islander” designations subsume a heterogeneous group of countries and cultures. The U.S. Census, for example, includes persons originating from at least 29 countries and 20 Pacific Island cultures in the “Asian/Pacific Islander” classification category.<sup>4</sup> According to the U.S. Census Bureau, Asian Americans make up about 5% of the popu-

lation and are projected to increase to 8% or higher by 2050.<sup>5,6</sup>

As the U.S. population grows, the percentage of children belonging to ethnic minorities is expected to increase disproportionately.<sup>7</sup> In the midst of a childhood obesity epidemic with far-reaching implications for the nation's health and economy,<sup>8</sup> it is increasingly important to understand which children are at risk of becoming obese and suffering from its consequences during childhood and adulthood. It is particularly critical to understand the risk of obesity in young children, before obesity and poor habits become entrenched and when parents are most influential.<sup>9,10</sup> In addition, if some subgroups of children seem relatively protected from weight gain despite living in an obesity-promoting envi-

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An abstract with some of these results was presented as a poster at two national meetings: The Obesity Society meeting in October, 2008, and the Pediatric Academic Societies meeting in May, 2008.

ronment, their eating and activity behaviors may point toward feasible and successful strategies for preventing obesity more broadly.

Until recently, national surveys have not included large enough samples of Asian-American children for meaningful analysis of obesity risk by Asian ethnicity (country of origin). The Early Childhood Longitudinal Study–Birth Cohort (ECLS-B) is a nationally representative, longitudinal study of children born in the United States in 2001. The study oversampled Asian-American young children, thus enabling estimates of obesity prevalence by Asian country of origin. Using the ECLS-B, we estimated the prevalence of obesity among young Asian-American children by their mothers' Asian ethnicity, generational status, and family socioeconomic factors.

## Methods And Procedures

The data used in the present study are derived from the ECLS-B wave III (4 years old/preschool age). The ECLS-B is a multisource, multimethod study focused on the early experiences of a nationally representative cohort of children, born in the United States in 2001 and followed until they enter kindergarten. The ECLS-B study was strengthened by oversampling Asian and Pacific Islander infant populations and by publishing sampling weights, which allow for analyses that represent the target population. Asian Americans make up about 12% of the unweighted sample of children, representing 3% of the population after weighting. Thus, the ECLS-B data provide us with an unprecedented opportunity to study growth patterns within these minority racial/ethnic groups.

### Participants

At wave III of the ECLS-B, approximately 8900 parent–child pairs participated, yielding an unweighted response rate of 91.2%. For this analysis, participants were excluded from the sample if (1) the parent interview respondent was not the child's biological mother, meaning that reported family characteristics would not necessarily correspond to birth certificate race/ethnicity classifications, (2) the children's 4-year-old BMI measurements and mothers' race/ethnicity or birthplace (nativity) were missing; or (3) the mothers' race/ethnicity was not Asian or white (as the comparison group). Less than 5% of cases ( $n \approx 400$ ) were excluded because the child's biological mother was not the parent interview respondent, and an additional 4% were excluded because BMI measurements were missing. Also excluded were approximately 50 cases in which the mothers' race/ethnicity was missing from their child's birth certificate. The final analytic sample consisted of approximately 6300 children whose mothers were either Asian ( $n \approx 1100$ ) or white ( $n \approx 5250$ ). All unweighted sample sizes are rounded to the nearest 50 as required by the data use agreement.

### Procedures

The ECLS-B sampled birth certificates for information about biological mothers' race/ethnicity and place of birth. Asian ethnic categories included Chinese, Japanese, Filipino, Asian Indian, Korean, Vietnamese, and Other Asian/Pacific Islander ("Other Asian/Pacific Islander" did not include Hawaiian, Samoan, or Guamanian because those were separate classifications not included in the Asian-American categories). Mothers' race/ethnicity from the birth certificate was used as a proxy for the child's because the response categories for mother-reported child race/ethnicity did not specify Asian ethnicity/country of origin. We included the biological mother's country of birth, or nativity status, as a measure of child generational status.<sup>11</sup> If a mother was foreign-born (born outside the United States), then her child is second generation (*i.e.*, the child of first-generation immigrants); and if a mother was born in the United States, then her child was considered third generation (or greater).

Family socioeconomic factors were reported by parents, the overwhelming majority of whom were biological mothers, via computer-assisted personal interviews at each wave of data collection. We recoded mothers' highest level of education as less than high school, high school diploma or equivalent, attended some college or college graduate, and graduate/professional school or degree. The ECLS-B includes a set of poverty indicators derived from household income, number of residents, and current federal poverty threshold, which indicates whether families are "below" or "at or above" 100%, 130%, and 185% of the federal poverty level. We recoded poverty status as less than 100%, 100%–130%, 130%–185%, and above 185% of the poverty level. These levels correspond to commonly used criteria for public assistance programs [*e.g.*, Medicaid, Women, Infants, and Children (WIC) program] eligibility.<sup>12,13</sup>

Standard measurement of children's height and weight was conducted by trained research staff during home interviews, allowing for calculation of BMI, BMI *z*-scores, and classification of weight status (underweight, normal weight, overweight, or obese). The primary outcome variable for these analyses was the weight status of children as indicated by their BMI *z*-score, which is considered the best standard measurement for the clinical determination of weight status in children.<sup>14</sup> BMI *z*-scores were calculated using child age, gender, height, and weight information, and weight status was classified according to the recommended parameters from the National Center for Health Statistics (NCHS) 2000 growth charts.<sup>15</sup> Overweight was defined as having a BMI  $\geq 85^{\text{th}}$  percentile for age and gender, and obese as having a BMI  $\geq 95^{\text{th}}$  percentile for age and gender, corresponding to BMI *z*-scores of +1.036 and +1.645 respectively.<sup>16</sup>

### Analytic Strategy

SUDAAN software was used to generate all parameter estimates in the model as well as to calculate standard

errors that are able to account for the complex sampling design involving stratification, clustering, and multistage sampling. First, we estimated weighted frequencies and standard errors of mothers' nativity status and family socioeconomic factors by race/ethnicity. Next, we estimated weighted frequencies and standard errors of Asian ethnicity by weight status for the full sample, compared to whites. We also estimated weighted frequencies and standard errors for maternal nativity status and socioeconomic factors by weight status among Asian-American children only to estimate the unadjusted effects of these variables. Finally, stepwise logistic regression models were conducted to test the probability of obesity status depending on Asian ethnicity (step 1), nativity status (step 2), and socioeconomic factors (step 3) to examine predictors of childhood obesity among Asian Americans. Adjusted odds ratios (ORs) and 95% confidence intervals (CIs) express the probability of a child being overweight (relative to normal weight) while adjusting for other variables in the model.

## Results

### Demographic Characteristics of White and Asian Mothers in the ECLS-B (Wave III)

Table 1 shows the demographic characteristics of the white and Asian mothers and households who participated

at wave III of the ECLS-B. Most of the Asian-American children were second generation, with foreign-born mothers, although this varied by Asian ethnicity. Japanese and Filipino American mothers had higher percentages of third-generation+ children, *i.e.*, children born to mothers who were themselves born in the United States. Asians overall were of a higher socioeconomic status than whites, although this also varied by Asian ethnicity. Among Asians, Chinese mothers had the highest levels of education (44% with postbachelor's education), whereas Vietnamese mothers had the lowest, with almost half of the mothers having a high school degree or less. The percentage of families living below 130% of poverty level was highest among the Asian "Other" category and among Vietnamese-American families, whereas almost none of the Japanese-American families fell into the poverty category.

### Obesity Prevalence by Asian Ethnicity

Table 2 shows the prevalence of obesity and overweight among 4 year olds by Asian ethnicity in comparison to whites. According to current U.S. standards, 26% of Asian-American 4 year olds are obese or overweight, and 13% are obese. Although Asian-American children overall were at lower risk of obesity and overweight compared to whites, there was considerable variation by

**Table 1. Demographic Characteristics of Mothers of White and Asian-American Preschoolers**

	White (n ≈ 5250)	Chinese (n ≈ 400)	Japanese (n ≈ 50)	Filipino (n ≈ 150)	Asian Indian (n ≈ 100)	Korean (n ≈ 50)	Vietnamese (n ≈ 50)	Other Asian and Pacific Islander (n ≈ 300)
Mother's nativity status, % (95% CI)								
U.S. born	80.2 (78–82.4)	8.2 (4.73–11.67)	53.5 (33.43–73.57)	35.2 (25.85–44.55)	1.3 (–1.15–3.75)	18.4 (3.72–33.08)	2 (–.88–4.88)	23.4 (18.05–28.75)
Foreign born	19.8 (17.6–22)	91.8 (88.33–95.27)	46.5 (26.43–66.57)	64.8 (55.45–74.15)	98.7 (96.25–101.15)	81.6 (66.92–96.28)	98 (95.12–100.88)	76.6 (71.25–81.95)
Maternal education, % (95% CI)								
<High school	14.6 (12.82–16.38)	5.9 (2.65–9.15)	3.5 (–3.24–10.24)	1.7 (–.22–3.62)	5.1 (.02–10.18)	0 (0–0)	26.1 (6.72–45.48)	14.2 (9.65–18.75)
High school/ GED	30.4 (28.11–32.69)	11.2 (6.61–15.79)	12.1 (.58–23.62)	19.1 (11.4–26.8)	9.4 (1.95–16.85)	14.6 (4.02–25.18)	16.7 (4.02–29.38)	29.3 (22.52–36.08)
College	43.6 (41.07–46.13)	39.1 (32.49–45.71)	62.4 (45.68–79.12)	68.7 (59.39–78.01)	45 (35.04–54.96)	80 (68.18–91.82)	49.8 (30–69.6)	39.5 (33.68–45.32)
Postbachelors degree	11.5 (10.3–12.7)	43.8 (37–50.6)	22.1 (6.77–37.43)	10.5 (5.05–15.95)	40.6 (29.88–51.32)	5.4 (–1.48–12.28)	7.4 (2.21–12.59)	16.9 (11.53–22.27)
Family poverty status, % (95% CI)								
<100%	20.6 (19.35–21.85)	4.6 (2.35–6.85)	1.5 (–1.56–4.56)	12.6 (6.13–19.07)	10.3 (3.68–16.92)	9.5 (.46–18.54)	13.1 (.63–25.57)	16.9 (12.02–21.78)
100–130%	8.9 (7.98–9.82)	5.2 (2.38–8.02)	0 (0–0)	7.4 (3.36–11.44)	0.5 (–.58–1.58)	4.5 (–.34–9.34)	11.6 (3.09–20.11)	9.1 (5.08–13.12)
130–185%	12.9 (11.86–13.94)	4.5 (2.25–6.75)	16.6 (5.94–27.26)	10.4 (5.21–15.59)	6 (.90–11.1)	8 (.20–15.8)	22.6 (12.51–32.69)	11.7 (7.17–16.23)
>185%	57.6 (56.23–58.97)	85.7 (81.56–89.84)	81.9 (70.94–92.86)	69.5 (61.8–77.2)	83.1 (73.63–92.57)	7.79 (–6.05–21.63)	52.7 (38.84–66.56)	62.3 (55.34–69.26)

CI, Confidence interval; GED, general education development.

Asian ethnicity. The prevalence of both obesity and overweight among whites was 18% (each), with 36% of white 4 year olds either overweight or obese and only 26% with BMI values below the 50<sup>th</sup> percentile for age and gender. Among Asian Americans, Chinese American children were at significantly lower risk of overweight or obesity (23.5%) compared to whites, and Asian-Indian children were the least likely to be overweight or obese (15.6%). At 35%, Vietnamese American children approached the prevalence of obesity and overweight seen among whites; they also exhibited the highest prevalence of obesity at 24%, though not statistically significantly different than whites. Asian-American children overall were more likely than whites to be underweight. In particular, Asian-Indian children were the most likely to be underweight with a prevalence of 10%.

#### *Variation in Asian-American Children's Weight Status By Maternal Nativity Status, Education, and Family Poverty*

The bivariate analysis in Table 3 shows that among Asian Americans there is no significant association between mothers' country of birth and child's risk of overweight and/or obesity. There is a trend among Asian Americans suggesting that more maternal education confers protection from obesity and overweight. Children of mothers with less than a high school education had the highest rates of obesity or overweight (37%), significantly higher than those with a postbachelor degree (21.8%). Similarly, the families at the highest income levels had a much lower risk of obesity and overweight compared to

those living below 100% poverty, although small numbers of children in most subgroups limited the stability and statistical significance of the results.

#### *Multivariate Analysis of Risk for Obesity among Asian-American Children*

Results of the multivariate analysis examining predictors of obesity unique to Asian-American children are shown in Table 4. Chinese-American children are the reference group because they constituted the largest Asian-American subsample in the ECLS-B. Compared to Chinese-American 4 year olds, Vietnamese-American and Other Asian/Pacific Islanders were at increased risk of obesity. Other Asian/Pacific Islanders' heightened ORs lessened slightly after controlling for mother's country of birth and family socioeconomic factors, but both Vietnamese-American children and Other Asian/Pacific Islander American children remained at triple and double the risk compared to Chinese-American children, respectively.

Across Asian ethnicities, having a mother who was not born in the United States was protective against the development of obesity; *i.e.*, the risk of obesity among second-generation Asian-American children was almost half that of higher generations when controlling for Asian ethnicity, maternal education, and household poverty status. In addition, an Asian-American mother with less than a high school education had more than double the risk of her 4 year old being obese compared to the reference group of mothers with postbachelor degree education. Unlike maternal education level, family poverty status was not an

**Table 2. Prevalence of Childhood Overweight and Obesity by Maternal Ethnicity**

Ethnicity	Underweight % (95% CI)	Normal weight (<50 <sup>th</sup> %) % (95% CI)	Normal weight (>50 <sup>th</sup> %) % (95% CI)	Overweight % (95% CI)	Obese % (95% CI)	Overweight/ obese % (95% CI)
White	2 (1.51–2.59)	23.9 (22.21–25.73)	38.1 (35.8–40.55)	17.9 (16.42–19.38)	18.1 (16.56–19.75)	36 (34.29–37.65)
Asian overall	4.4 (3.09–6.26)	33.3 (29.8–36.93)	36.1 (32.41–39.87)	13.7 (11.7–88–15.78)	12.5 (10.29–15.21)	26.3 (23.58–29.13)
Chinese	2.7 (1.29–5.75)	30.3 (25.06–36.03)	43.5 (37.71–49.46)	14.9 (11.16–19.6)	8.6 (5.43–13.37)	23.5 (18.39–29.51)
Japanese	0 (0–0)	31 (18.12–47.73)	45 (29.24–61.89)	15.9 (6.37–34.33)	8.1 (2.29–24.85)	24 (11.63–43.0)
Filipino	2.8 (.96–8.02)	27.5 (19.41–37.52)	41.2 (30.77–52.58)	20.7 (13.85–29.86)	7.6 (3.18–17.26)	28.4 (19.06–39.99)
Asian Indian	10 (4.88–19.39)	42.3 (33.47–51.56)	32.2 (22.91–43.07)	10.2 (4.67–20.74)	5.4 (2.24–11.67)	15.6 (7.98–28.2)
Korean	1.1 (.12–9.04)	42.8 (27.93–59.12)	36 (21.16–54.02)	11.2 (4.06–27.24)	9 (3.18–22.85)	20.2 (9.69–37.27)
Vietnamese	7.9 (2.25–24.11)	31.7 (20.15–46.06)	25.7 (14.86–40.63)	11.1 (5.03–22.69)	23.6 (11.95–41.38)	34.7 (20.55–52.25)
Other Asian and Pacific Islander	4.7 (2.53–8.44)	34 (27.48–41.1)	31.6 (24.52–39.67)	11.6 (8.53–15.49)	18.2 (13.91–23.48)	29.8 (24.83–35.24)

CI, Confidence interval.

independent predictor of obesity risk for Asian-American children.

None of the interaction terms between Asian ethnicity and mothers' country of birth (foreign or United States) were statistically significant in the fourth step of the model (results not shown). Similar multivariate analyses performed for the outcome of overweight or obese (BMI ≥85<sup>th</sup> percentile for age and gender) resulted in similar trends as the analysis for the outcome of obesity but were not statistically significant (data not shown but available upon request).

### Discussion

Asian-American children have a lower prevalence of obesity (12.5%) and overweight (13.7%) compared to other racial/ethnic groups in the United States, but estimates for Asian-American children as a group, like those for Asian-American adults and adolescents, obscure a great deal of biological and cultural heterogeneity within the "Asian" designation. The prevalence of obesity and overweight is high among Vietnamese-American young children, resembling rates seen in white children. Vietnamese-American children have more than triple the risk of obesity compared to Chinese-American children, even after controlling for

maternal education, household poverty status, and mothers' country of birth, a proxy for child generational status. Children who fall into the "Other Asian/Pacific Islander" designation are also at elevated risk of obesity, although it is difficult to draw meaningful conclusions or generalize about a group that is itself so diverse.

This study found that Asian-Indian children have the lowest prevalence of obesity and overweight and the highest rates of underweight. Asian-Indian and Chinese-American children have significantly lower rates of obesity and overweight compared to whites. A national study of adolescents reported lower rates of obesity among Chinese and Filipino teens compared to whites and higher rates for other Asians.<sup>17</sup> However, previous nationally representative studies were not able to distinguish between Asian subgroups besides Chinese and Filipinos, precluding comparisons among the many Asian ethnicities potentially included.

Generational status was a strong predictor of risk of obesity; Asian-American children seemed protected from becoming obese if their mothers were born outside the United States. To our knowledge, this is the first study to show that maternal immigrant status can protect children from becoming obese even in the first few years of life irrespective of other important variables.

**Table 3. Prevalence of Childhood Overweight and Obesity by Maternal Nativity Status, Education, and Family Poverty Status for Asians Only**

	Underweight % (95% CI)	Normal weight (<50th %) % (95% CI)	Normal weight (>50th %) % (95% CI)	Overweight % (95% CI)	Obese % (95% CI)	Overweight/ obese % (95% CI)
<b>Nativity</b>						
US born (n ≈ 150)	2.1 (.65–6.39)	25.7 (18.49–34.63)	42.9 (34.42–51.88)	12.5 (8.26–18.61)	16.7 (10.89–24.8)	29.3 (22.06–37.69)
Foreign born (n ≈ 900)	5 (3.43–7.15)	35.1 (31.57–38.74)	34.4 (30.77–38.25)	14 (11.9–16.38)	11.5 (9.37–14.15)	25.5 (22.59–28.73)
<b>Education</b>						
<High school (n ≈ 100)	1 (.14–7.19)	30.3 (19.6–43.58)	31.7 (20.59–45.42)	11.4 (5.84–20.93)	25.6 (16.94–36.77)	37 (26.91–48.33)
High school/GED (n ≈ 200)	7 (3.82–12.64)	32.7 (25.02–41.41)	35 (26.96–44.1)	12.4 (7.51–19.93)	12.8 (7.68–20.52)	25.2 (18.44–33.48)
College (n ≈ 500)	3.8 (2.39–12.64)	32.9 (27.99–38.28)	36.4 (31.25–41.96)	16.1 (12.71–20.14)	10.7 (7.53–15.01)	26.8 (22.1–32.07)
Postbachelors degree (n ≈ 300)	4.8 (2.15–10.19)	35.7 (29.96–41.81)	37.8 (30.95–45.21)	10.7 (7.56–14.9)	11 (7.89–15.31)	21.8 (17.56–26.63)
<b>Poverty status</b>						
<100% (n ≈ 100)	6.3 (2.76–13.88)	34.2 (23.79–46.43)	26.2 (17.6–37.0)	16.2 (8.89–27.73)	17.1 (9.65–28.44)	33.3 (22.47–46.21)
100–130% (n ≈ 50)	2.79 (.67–10.48)	31.7 (18.9–47.92)	45.2 (30.75–60.49)	10.5 (4.73–21.62)	9.9 (3.64–24.35)	20.4 (10.96–34.82)
130–185% (n ≈ 100)	7.4 (3.03–16.94)	34.5 (23.98–46.71)	30.4 (20.05–43.27)	17.3 (10.79–26.47)	10.5 (4.48–22.53)	27.7 (18.79–38.85)
>185% (n ≈ 800)	3.9 (2.48–6.01)	33.1 (28.95–37.58)	37.5 (33.16–42.06)	13.2 (11.02–15.65)	12.3 (9.89–15.27)	25.5 (22.67–28.55)

CI, Confidence interval; GED, general educational development.

Studies of Asian adults, adolescents, and older children have also found that generational status is an important predictor of obesity rates,<sup>1,3,11,17</sup> which tend to increase with length of time living in the United States and likely related to the adoption of mainstream eating, activity, and television habits. However, one small study of Chinese-American children in California found that a low level of parental acculturation among recent immigrants was a risk factor for obesity, potentially related to a lower level of physical activity among Chinese-American children compared to their white and African-American counterparts.<sup>18</sup>

A recent report from the 2003 National Survey of Children's Health (NSCH) found that first-generation (foreign-born) 10- to 17-year-old Asian-American children had a higher prevalence of obesity than whites, and that second-generation children the lowest prevalence at 6.3%.<sup>3</sup> Because all of the children in our study were born in the United States, there were no first-generation Asian-American children included for comparison. For our nationally representative sample of preschoolers, however, the prevalence of obesity among second-generation Asian-American children was also significantly lower than among

whites, but substantially higher at 14% than the results of the NSCH. Although the NSCH is also a national survey that was weighted according to age, sex, and racial/ethnic categories, weighting was done at the state level, and groups that comprised less than 4.5% of the sample were merged with larger groups for weighting purposes. In addition, child height and weight were reported by respondents rather than measured directly as in the ECLS-B. Last, there was no differentiation of children by Asian ethnicity in the NSCH. For these reasons, our higher estimates of obesity in preschool-aged children may be more accurate and perhaps signify a later stage of the childhood obesity epidemic, with higher estimates of obesity prevalence even in children that are much younger and in a relatively low risk group by virtue of their Asian ethnicity.

Studies in adults show that despite lower BMIs, Asian Americans can have higher true obesity (adiposity, visceral adiposity) and cardiovascular risk compared to their white counterparts.<sup>19-22</sup> In other words, BMI as a proxy for the amount of adipose tissue may be a particularly poor measure of obesity and its risk for Asians, including children. Thus, although we found markedly lower rates of obesity among children of certain Asian ethnicities, we may be underesti-

**Table 4. Predictors of Childhood Obesity among Asian-American Preschoolers**

	Model 1: Differences across Asian ethnic groups		Model 2: Additional variance explained by maternal nativity		Model 3: Additional variance explained by maternal education and poverty	
	OR (95% CI)	p	OR (95% CI)	p	OR (95% CI)	p
<i>Asian ethnicity</i>						
Chinese	1 (1-1)		1 (1-1)		1 (1-1)	
Japanese	0.94 (0.24-3.66)	0.92	0.73 (0.19-2.82)	0.65	0.75 (0.19-2.95)	0.68
Filipino	0.88 (0.3-2.55)	0.81	0.75 (0.24-2.32)	0.62	0.85 (0.26-2.79)	0.78
Asian Indian	0.61 (0.24-1.54)	0.29	0.63 (0.25-1.62)	0.34	0.63 (0.24-1.65)	0.34
Korean	1.05 (0.31-3.54)	0.94	0.99 (0.3-3.21)	0.98	1.09 (0.34-3.57)	0.88
Vietnamese	3.29 (1.22-8.88)	0.02	3.42 (1.27-9.24)	0.02	3.41 (1.17-9.91)	0.03
Other Asian and Pacific Islander	2.37 (1.3-4.32)	0.01	2.18 (1.19-3.99)	0.01	2.18 (1.10-4.33)	0.03
<i>Mothers' nativity status</i>						
U.S. born			1 (1-1)		1 (1-1)	
Foreign born			0.6 (0.34-1.05)	0.07	0.55 (0.32-0.95)	0.03
<i>Maternal education</i>						
< High school					2.27 (1.0-5.17)	0.05
High school/GED					0.96 (0.46-2.01)	0.91
College					0.85 (0.49-1.47)	0.56
Postbachelors degree					1 (1-1)	
<i>Family poverty status</i>						
<100%					0.88 (0.47-1.64)	0.68
100-130%					0.46 (0.15-1.41)	0.17
130-185%					0.55 (0.19-1.58)	0.27
>185%					1 (1-1)	

OR, Odds ratio; CI, confidence interval; GED, general educational development.



mating true adiposity by using a BMI-dependent measure to define obesity; a proportionately lower rate of obesity-related consequences may not necessarily follow. Also, in our data, Asian-Indian children seem to have a remarkably low prevalence of obesity at 4 years of age, yet they could conceivably turn out to have elevated rates of adiposity and cardiovascular disease as adults, which other studies<sup>23,24</sup> have documented. Perhaps prevention between the preschool age and adulthood is especially important for these children.

### Limitations

Although the ECLS-B oversampled Asian Americans, allowing for differentiation of risk by Asian ethnicity to a greater degree than other studies, the numbers of Asian-American children were still too small to allow for more detailed multivariable analysis or stratification by important variables such as parents' weight status. Thus, although similar trends were seen for risk of overweight as for obesity, results did not reach statistical significance for the former. Furthermore, selection bias may have affected the results. Chinese children were overrepresented, for example, allowing for more stable estimates of outcomes and variables for Chinese Americans compared to other Asians, although collapsing any distinctions among Chinese origin such as country/region or language. Thus, mothers classified as "Chinese" may very well have been from Taiwan or Tibet, and no further distinction was available regarding the different ethnicities from within China. Because phone messages were used to recruit participants, families with landlines were overrepresented, potentially skewing the results toward families of higher socioeconomic status, although telephone coverage bias has not been shown to alter estimates of the variables of interest.<sup>25</sup> Furthermore, the main outcome variable of child's weight status was derived from direct measurements and the main independent variable of mother's ethnicity was corroborated by birth certificates.

Perhaps the main limitation of the current study was the use of maternal race/ethnicity for the child's ethnic classification and maternal birthplace as a proxy for the generational status of the child. In our data, 8% of children were missing information on fathers' ethnic classification. Of those with father data, 74% of Asian-American children's parents were of the same ethnicity, although this also varied by mothers' Asian ethnicity. Asian-Indian children were very likely to have parents of the same ethnicity at 97%, whereas only 27% of Japanese-American children had both a Japanese mother and father. Including children with one Asian parent in the Asian-American sample may have skewed results toward more similarity with whites, as most of the nonmatching fathers were white.

### Conclusion

The United States is often called a "melting pot" because it is not a single culture but a country of immigrants from every part of the world, arriving at varying

times in our national history. Non-whites are projected to outnumber whites soon; percentages of many non-white ethnicities, including Asian Americans, are increasing.<sup>6</sup> Unlike some other immigrant groups, Asian Americans have been considered success stories in that they fare well in our educational system and often thrive in terms of both socioeconomic status and health. However, our study illustrates that as Asian Americans assimilate into our society, they may also be assuming a higher risk of obesity and its complications. Should this phenomenon persist for Asians or other new immigrant groups who arrive relatively protected from obesity, the implications for the health, quality of life, and mortality of Americans could be substantial. Our study shows that the loss of the immigrant's protective shield against obesity may be beginning as young as the preschool age, underscoring the need for early family-based prevention efforts. Furthermore, our results point to potential opportunities to study and adopt the healthful eating and activity practices of Chinese and Asian-Indian families in particular so that all American children, irrespective of race/ethnicity, may benefit.

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### Author Disclosure Statement

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