

I. Introduction

A. Nature of the Research Problem

The growing prevalence of childhood obesity, even among preschoolers, supports the need to understand factors that contribute to obesity among high risk populations. Demographic shifts and the growing proportion of foreign born US children reinforce our work. Among young children, little is known about whether dietary habits, physical activity, and family characteristics contribute to overweight. This study investigated relations among feeding practices, physical activity, maternal duration in the US, and overweight among children with foreign born parents in the first 4 yrs of life.¹

B. Purpose, Scope and Methods of the Investigation

The goal of the proposed study was to assess whether factors associated with overweight vary in the first 4 years of life. The 2 specific aims were to examine:

- 1) Factors associated with overweight among children at 9 mos, 2 years, and 4 years of age;
- 2) Whether risk factors for overweight vary by maternal duration in the US among children with foreign born mothers.

Data for our study are from the Early Childhood Longitudinal Study, Birth Cohort (ECLS-B) led by the US Dept of Education and other federal agencies including MCHB. ECLS-B follows a nationally representative cohort of 10,688 children born in 2001. There are data on length/height and weight, physical and sedentary activities, and maternal report of feeding practices at 9 months, 2 and 4 yrs. Additionally, birth certificates provide data about maternal and birth characteristics.

C. Nature of the Findings

The study results indicate that having a foreign born mother does not protect from early childhood obesity. The prevalence of obesity among children with native born vs. foreign born mothers is comparable at 9 months. By 4 years of age, the prevalence of obesity is higher among children with foreign born rather than native born mothers. At both time points, there was no difference in the prevalence of obesity related to duration of stay of foreignborn mothers in the US. Finally, children of foreign born mothers have higher prevalence of obesity and comparable risk factors as their peers with native born mothers

II. Review of the Literature

A. Consequence of and Increasing Prevalence of Childhood Overweight and Obesity

Consequences of childhood obesity include increasing risk of being obese as adults and poorer physical, emotional, and social health.² Overweight children experience more cardiovascular risk factors even in childhood, and adult obesity increases risks of cardiovascular disease, diabetes and other chronic conditions.³ The percentage of overweight children, ages 2-19 years, rose from 13.9% to 17.1% from 1988-1994 to 2003-4 with increases among 2-5 year olds (7.2% to 13.9%), 6-11 year olds (11.3 to 18.8%), and teens aged 12-19 (10.5 to 17.4%).^{4,5} Mei found that overweight in infancy and early childhood (12-35 mos) persists through the preschool years suggesting the need to focus on the emergence of overweight in the early years.⁶

B. Racial/Ethnic Disparities in Childhood Obesity, Even Among Preschoolers

Although obesity affects children of all races and ethnicity, persistent disparities exist by race/ethnicity with non-white children disproportionately affected. In 2003-4, 16.3% of Non-Hispanic White, 19.2% Mexican American and 20.0% of Non-Hispanic Black children 2-19 yrs were obese. Respective percentages in 1999-2000 were 11.0%, 20.2%, and 18.8%.¹ Even among children 2-5 yrs, the largest percentage obese are Mexican American (19.2%), followed by Non-Hispanic Black (13.0%), and Non-Hispanic White children (11.5%).

C. Factors Associated with Overweight

A complex set of interrelated factors contribute to overweight including genetic, behavioral, and environmental factors.⁷ Overweight reflects an imbalance between energy intake and energy expenditure; children consume too many calories relative to the number of calories used.² Racial/ethnic disparities may be accounted for, in part, by economic disparities, differential access to healthy foods, disparities in physical and sedentary activity, and differential access to recreational facilities;²⁻³ however, few efforts have focused on overweight among children of foreign born parents despite their growing prevalence in the US.

Reasons for the high prevalence of overweight among Hispanic preschoolers remain unclear. Whitaker found that racial differences in maternal education, household income, and food security did not explain the high prevalence of obesity among low income, Hispanic pre-school children.⁸ Kimbro found that maternal wt status, birthwt, and taking a bottle to bed were related to overweight at age 3 but concluded that unmeasured factors accounted for racial/ethnic differences in weight.⁹ Study results related to food security and overweight in children are mixed.¹⁰⁻¹² For Mexican Americans, soda consumption among preschoolers¹³, eating fast-food for children ages 4-7¹⁴, and tv viewing and sweetened beverage consumption among kindergartners¹⁵ are associated with overweight. However, some researchers suggest that biological and SES factors, not feeding strategies relate to overweight.¹⁶ We are not aware of studies linking acculturation with overweight for Mexican Am children, though it has been related to obesity for adults^{15,17} and feeding practices of mothers.¹⁸ A pilot study of Hispanic families found no association between acculturation (language, media use, social relations) and overweight.¹⁵

Hispanic women share socioeconomic disadvantage with other minority groups, but paradoxically have favorable birth outcomes (preterm, LBW, infant mortality) compared with non white infants.^{19,20} Part of this difference is lower rates of small-for-gestational-age infants of foreign born Mexican American mothers.²¹ Although rapid initial wt gain among normal birth weight infants is associated with overweight at 4 ½ yrs²², rapid wt gain has not been studied among preschool Mexican American children.

D. Time in the US Among Foreign Born and Obesity

Some adult studies report increasing obesity in immigrants with increasing time in the US^{17, 23-26} and with each generation after immigration; increased duration of residence in the US is associated with adoption of less favorable diets, less exercise among men, and perceptions of weight gain as a marker of good health.^{27,28} Little is known about duration of US residence of parents and overweight among children, although 1 study of low-income Mexican American families found no relation of maternal acculturation with wt-for-height, ht-for-age, or BMI of preschoolers.¹⁸ These relations are important because of the growing proportion of children in the US with 1 or both foreign born parents; from 1994-2004, this percentage rose from 12 to 17% for ages 0-17.²⁹ Children of foreign born parents may be at high risk of obesity, because they disproportionately grow up in low income households with food related problems.³⁰

III. Study Design and Methods

A. Study Design

This research involved a secondary analysis of data collected from ECLS-B, a longitudinal cohort study with a nationally representative probability sample of children born in 2001. Data sources included: birth certificates, parent interviews, self administered questionnaires, and direct observations when the index child was 9 months and 4 years of age.

B. Population Studies

Subjects were mothers enrolled in ECLS-B, a nationally representative probability sample of all children born in the US in 2001 except those who: 1) were born to mothers < 15 years; 2) died before 9 months; or 3) were adopted before 9 months. Over 14,000 births were sampled and over 10,000 completed 9 month parent interviews. The sample included births occurring in counties in 46 states and Washington, DC with oversampling of children who were American Indian and Alaska Native, Chinese and other Asian and Pacific Islander, twins, or low or very low birth weight in order to reflect the diversity of the nation as a whole with regard to socio-demographic characteristics.

C. Sample Selection

At 9 months and 4 years, study eligibility included having complete child data on weight and length and the availability of parent interviews from biological or other types of mothers. Exclusion criteria included outliers for z values for weight-for-length at 9 months (about 100), weight gain in the first 9 months (about 50), and weight gain after 2 years (about 50). About 9700 and 8150 children comprised the final analytic sample at 9 months and 4 years, respectively.

D. Instruments Used

Three modes of data collection in ECLS-B informed this study: birth certificates, direct child assessments at 9 months and 4 years, and computer assisted parent interviews at 9 months and 4 years. ECLS-B data also were collected when children were 2 years (range 16-39 months). However, data at 2 years were not used due to different measurements of attained size (length \leq 24 months; height \geq 24 months) and, accordingly, different reference populations. Birth certificates provide data on prenatal and neonatal characteristics at the time of the child's birth. Direct child assessments provide information regarding the child's physical growth. Parents detailed family socio-demographic characteristics, maternal education and employment, feeding practices and children's physical and sedentary activities at both times.

E. Statistical Techniques Employed

Data cleaning and editing largely related to the physical measurements.¹

We constructed a categorical variable of maternal duration in the US for mothers not born in the U.S. This was calculated by subtracting the age she moved to U.S from the current age. We constructed two different categorical variables for maternal foreign-born status. The first one included: (1) not foreign born; (2) foreign-born, U.S stay \leq 5 years; (3) foreign-born, U.S stay > 5 years & \leq 10 years; (4) foreign-born, U.S stay > 10 years & \leq 15 years; and (5) foreign-born, U.S stay > 15 years. The second one grouped maternal foreign born status into a) not foreign born; b) foreign-born, U.S stay \leq 10 years; and c) foreign-born, U.S stay > 10 years. Analyses were comparable with the 2 groupings, and we opted to report the latter.

Next, we calculated normalized (z-score) weight-for-length ratio at 9 months and body mass index (BMI) at 4 years. Overweight was defined as a weight-for-length ratio at or above the 95th percentile at 9 months; obesity was defined as a BMI at or above the 95th percentile at 4 years for age and sex using the 2000 Centers for Disease Control and Prevention growth charts for the US.

Analyses were conducted in Stata 10. Due to the complex sample design, sample weights were applied to account for stratification, clustering, and unit non response. In keeping with the restricted-use data license agreement, all unweighted numbers were rounded to the nearest 50.

We performed bivariate analyses to assess the relation between each independent variable and the outcomes. Weighted two-way tabulations were conducted to explore associations between possible risk factors and overweight/obesity. To examine the significance of these associations, Pearson chi-square statistics were computed and corrected for the survey design using the second-order correction. Extension of the Wilcoxon rank-sum test³¹ was performed to examine the trend across ordered groups. Weighted simple logistic regression models were fit to estimate the unadjusted OR's for each independent variables and outcome. Based on the results of the bivariate analysis, significant variables for either 9 months or 4 years ($p < 0.05$) were included in weighted models.

IV. Detailed Findings

A. Prevalence of Overweight at 9 months and Obesity 4 years

At 9 months, the weighted prevalence of overweight was 15.4%. There was no significant difference between children with native-born vs. foreign-born mothers, regardless of duration in the U.S. At 4 years, the weighted prevalence of obesity was 18.0% for the full sample, 14.9% for children with native-born mothers, 17.5% for children with foreign-born mothers who had stayed in the U.S. 10 years or less, and 17.3% for children with foreign-born mothers who had stayed in the U.S. more than 10 years. The prevalence of obesity was higher among children with foreign-born rather than native-born mothers ($p < 0.05$); there was no difference in the prevalence of obesity related to duration of stay of foreign-born mothers in the U.S. ($p > 0.05$).

Among the 26.2% of mothers who were foreign-born, the mean duration in the U.S. was 10.4 years at 9 months (SE=0.18). At 4 years, among the 24.9% mothers who were foreign-born, the mean duration was 13.7 years (SE=0.18).

B. Association Between Risk factors and Overweight at 9 Months Among Foreign-born and Native-born Mothers (Table 1)

At 9 months, among children with native-born mothers, speaking Spanish at home, having higher weight gain during pregnancy, and being black were associated with increased odds of being overweight. Among children with foreign-born mothers, these associations were not observed. Among both groups, low birth weight was protective against being overweight.

Table 1. Adjusted Association between Risk factors and Overweight at 9 Months Among Foreign-born and Native-born Mothers

Characteristic	Foreign-born mother		Native-born mother		p-value [†]
	Adjusted OR	95% CI	Adjusted OR	95% CI	
Family Characteristics					
Language speak at home					
English	1.00	---	1.00	---	---
Spanish	0.89	0.47, 1.68	1.87	1.14, 3.10*	0.05*
Other languages	1.13	0.67, 1.89	1.07	0.34, 3.36	0.94
Maternal Characteristics					
Pre-pregnancy weight (Tertiles)					
Low	1.00	---	1.00	---	---
Middle	1.06	0.74, 1.52	1.23	0.95, 1.59	0.51
High	1.34	0.92, 1.95	1.59	1.27, 2.00	0.43
Weight gain during pregnancy (Tertiles)					
Low	1.00	---	1.00	---	---
Middle	0.72	0.54, 0.97	1.37	1.10, 1.70*	0.00*
High	0.96	0.65, 1.41	1.47	1.13, 1.91*	0.05*
Depressive symptoms					
None	1.00	---	1.00	---	---
Mild	1.17	0.73, 1.88	0.97	0.80, 1.16	0.43
Moderate	0.99	0.56, 1.77	1.07	0.77, 1.48	0.83
Severe	0.52	0.19, 1.39	0.65	0.43, 0.99*	0.68
Plurality					
Singleton	1.00	---	1.00	---	---
Multiple	0.62	0.36, 1.09	0.69	0.53, 0.89*	0.78
Child Characteristics					
Birth weight					
Normal birth weight	1.00	---	1.00	---	---
Low birth weight	0.63	0.38, 0.99*	0.56	0.41, 0.75	0.58
Very low birth weight	0.55	0.29, 1.05	0.44	0.32, 0.61	0.63
Race/ethnicity					
White, non-Hispanic	1.00	---	1.00	---	---
Black, non-Hispanic	1.24	0.64, 2.37	1.34	1.04, 1.72*	0.82
Asian, non-Hispanic	0.63	0.38, 1.03	0.95	0.39, 2.27	0.43
Hispanic	1.51	0.73, 3.12	0.95	0.68, 1.34	0.24
Other	0.75	0.35, 1.60	1.13	0.80, 1.60	0.29

[†] Comparison of coefficients between two models

C. Association Between Risk Factors and Obesity at 4 Years Among Foreign-Born and Native-Born Mothers

At 4 yrs, for children with native-born mothers, risk factors for obesity included not owning a home, higher pre-pregnancy weight, gain more weight during pregnancy, normal birth weight, more weight gain for children in the first 9 months, eating more than serving of juice daily, and using the computer 3 or more times weekly. For children with foreign born mothers, higher pre-

pregnancy weight, more weight gain for children in the first 9 months, lower mother education and being black or Hispanic were associated with higher risk of obesity

Table 2. Adjusted Association between Risk factors and Overweight at 4 years Among Foreign-born and Native-born mothers

Characteristic	Foreign-born mother		Native-born mother		p-value
	Adjusted OR	95%CI	Adjusted OR	95%CI	
Family Characteristics					
Household income					
\$ 25000 or less	1.00	---	1.00	---	---
more than \$25000	1.37	0.91, 2.07	1.07	0.79, 1.46	0.33
Housing situation					
Own your home	1.00	---	1.00	---	---
Not own your home	0.80	0.52, 1.22	1.46	1.14, 1.88*	0.02*
Language speak at home					
English	1.00	---	1.00	---	---
Spanish	0.83	0.42, 1.65	1.39	0.73, 2.67	0.30
Other languages	0.99	0.54, 1.79	2.33	0.86, 6.30	0.18
Maternal Characteristics					
Education					
Some HS or less	1.00	---	1.00	---	---
HS graduate	0.59	0.35, 1.00	1.08	0.79, 1.48	0.07
Some college	0.39	0.24, 0.63*	1.06	0.74, 1.53	0.00*
College and beyond	0.74	0.42, 1.29	0.79	0.52, 1.18	0.87
Pre-pregnancy weight (Tertiles)					
Low	1.00	---	1.00	---	---
Middle	1.01	0.69, 1.46	1.62	1.22, 2.15*	0.07
High	2.32	1.44, 3.73*	2.30	1.78, 2.97*	0.98
Weight gain during pregnancy (Tertiles)					
Low	1.00	---	1.00	---	---
Middle	0.95	0.67, 1.34	1.23	1.00, 1.51*	0.21
High	1.16	0.76, 1.78	1.64	1.24, 2.17*	0.16
Plurality					
Singleton	1.00	---	1.00	---	---
Multiple	1.25	0.72, 2.16	0.41	0.29, 0.58*	0.00*
Child Characteristics					
Birth weight					
Normal birth weight	1.00	---	1.00	---	---
Low birth weight	0.68	0.40, 1.18	0.55	0.41, 0.74*	0.49
Very low birth weight	0.55	0.30, 1.02	0.33	0.24, 0.47*	0.14
Race/ethnicity					
White, non-Hispanic	1.00	---	1.00	---	---
Black, non-Hispanic	2.26	0.98, 5.23	0.85	0.65, 1.11	0.03*
Asian, non-Hispanic	1.86	0.84, 4.10	0.89	0.38, 2.08	0.21
Hispanic	3.51	1.41, 8.72*	0.88	0.65, 1.18	0.00*
Other	1.31	0.59, 2.91	1.28	0.96, 1.71	0.96
Weight gain in the first 9 months					
1st quintile (lowest)	1.00	---	1.00	---	---

2nd quintile	2.02	1.15, 3.57*	1.15	0.79, 1.69	0.08
3rd quintile	2.14	1.18, 3.90*	1.82	1.28, 2.59*	0.64
4th quintile	3.02	1.72, 5.30*	2.60	1.93, 3.49*	0.62
5th quintile	4.84	2.73, 8.61*	4.50	3.18, 6.36*	0.83
Feeding Practices					
Ever breastfeed					
No	1.00	---	1.00	---	---
Yes	0.74	0.45, 1.23	0.76	0.62, 0.93*	0.94
> 1 serving 100% juice daily					
No	1.00	---	1.00	---	---
Yes	0.85	0.60, 1.21	1.23	1.00, 1.52*	0.06
Physical and Sedentary Activities					
> 2 hrs daily TV, video and DVD on week days					
No	1.00	---	1.00	---	---
Yes	1.43	0.97, 2.10	1.02	0.78, 1.32	0.14
TV rules/routines					
No	1.00	---	1.00	---	---
Yes	0.86	0.51, 1.45	0.80	0.61, 1.06	0.83
Computer use \geq 3 times/week					
No	1.00	---	1.00	---	---
Yes	0.70	0.44, 1.10	1.39	1.09, 1.76*	0.01*

† Comparison of coefficients between two models

D. Factors Associated with Overweight at 9 Months and Obesity at 4 Years for Children with Foreign and Native Born Mothers¹

Maternal foreign born status was not significantly associated with overweight at 9 months or obesity at 4 years after controlling for confounders; maternal pre-pregnancy weight, weight gain during pregnancy, birth weight and plurality were strong predictors for both.

At 9 months, having a mother with severe depressive symptoms was associated with a 38% decrease in the odds of overweight, but this effect faded by 4 years. Black children had 33% higher odds of being overweight and Asian children, a 34% lower odds than white children. Going to bed with a bottle was associated with a 20% increase in the odds of overweight.

After adjustment for other covariates, at 4 years, a perception of living in a less safe neighborhood was associated with a 20% increase in the odds of obesity. One of the strongest predictors for obesity was weight gain in the first 9 months. Compared with children whose weight gain in the first 9 months was in the first quintile, the odds ratios for those whose weight gain in the first 9 months was in third, fourth and fifth quintiles were increased by 85, 160 and 350%. Family characteristics, including not owning a home and speaking Spanish at home remained associated with higher odds of obesity after controlling for other variables; however they were only marginally significant. Ever breastfeeding was protective at 4 years (OR 0.76; 95% CI: 0.63 - 0.92, p=0.01). Each 1 unit increase in days of eating dinner as a family was associated with 5% decrease in the odds of obesity (p=0.03).

V. Discussion and Interpretation of Findings

A. Conclusions to be Drawn from Findings

There is no protective effect of having a foreign born mother on early childhood obesity. Children of foreign born mothers have higher prevalence of obesity at 4 years of age and

comparable risk factors as their peers with native born mothers. At 4 years of age, comparable risk factors for obesity among children of native-born and foreign-born mothers include higher pre-pregnancy weight and weight gain in the first 9 months. Among all children, maternal pre-pregnancy weight, weight gain during pregnancy and early weight gain of infants are the strongest predictors of early childhood obesity.

The lack of protective effect may reflect the fact that foreign born immigrants are more likely to have lower family income and to live in low resource neighborhoods, which are likely associated with increased intake of unhealthy foods, decreased physical activity, and limited access to healthy food outlets and safe recreational spaces.

These findings suggest that focusing on the health of women before conception and during the perinatal period is essential to addressing childhood obesity. Moreover, greater efforts are needed in early childhood to address rapid weight gain during the first 9 months. Assessing childhood obesity among various immigrant groups may provide an opportunity to identify potentially modifiable social, behavioral, and environmental factors.

B. Explanation of Study Limitations

Several limitations of our study are noted. First, ‘foreign born’ mothers in this study were those who were born outside the United States, while the U.S. Census Bureau uses this term to refer to those who are not U.S. citizens at birth.³² Second, ECLS provides limited information on children’s nutrition, feeding patterns or physical activity; however the large sample, relative to NHANES and other studies, permits more refined analyses focused on preschool children. Third, there is not adequate power to perform subgroup analysis of children by the country of origin of their foreign-born mothers. We explored the subgroup of children with foreign born mothers from Mexico, but found no significant association between most independent variables and the odds of obesity. Finally, as in all cohort studies, there were some losses to follow up of respondents between the two waves of data collection reported here; this may cause selection bias. We observed that children who were overweight at 9 months were more likely to drop out from the study at 4 years.

C. Comparison with Findings of Other Studies

Using ECLS-B data, Whitaker et al recently reported prevalence of obesity in early childhood using ECLS-B. However, analyses did not assess distribution of risk factors among children with foreign vs. native born mothers or the role of maternal duration in the US among foreign born mothers on the emergence of early childhood obesity.

D. Possible Application to Actual MCH Health Care Delivery Situations

These findings suggest that greater efforts are needed to address the health of women and to monitor childhood weight among various immigrant groups as noted in Section VA above.

E. Policy Implications

There is no evidence that increased maternal duration in the US increases the risk for obesity among children with foreign born mothers. Strategies to address early childhood obesity need to consider the role of community and environmental factors that confront children with foreign born mothers, regardless of acculturation. A focus on health of women prior to conception and on women’s and infant’s health in the perinatal period are key to addressing childhood obesity.

F. Suggestions for Further Research

Suggestions for further research include identification of modifiable factors that influence the development of childhood obesity among children with foreign born mothers and an evaluation of interventions in the perinatal and preconceptional period on childhood obesity.

VI. List of Products

One presentation occurred at the Pediatric Academic Societies Annual meeting (5/09), one peer reviewed manuscript has been published¹ and a second peer reviewed manuscript is in preparation. Findings also were presented at the annual Research Symposium held in the Dept of Population, Family and Reproductive Health at Johns Hopkins (5/09).

References

- ¹ Li N, Strobino D, Ahmed S, Minkovitz CS. Is There a Healthy Foreign Born Effect for Childhood Obesity in the United States? *Matern Child Health J.* 2010 March 14. Epub.
- ² Institute of Medicine. Committee on Prevention of Obesity in Children and Youth. Preventing Childhood Obesity: Health in the Balance. Committee on Prevention of Obesity in Children and Youth, Food and Nutrition Board, Board on Health Promotion and Disease Prevention. Ed Koplan JP, Liverman CT, Kraak VI. 2005. National Academy Press. Washington, DC.
- ³ A Nation At Risk: Obesity in the United States: A Statistical Sourcebook. American Stroke Association and American Heart Association. Robert Wood Johnson Foundation, American Heart Association, American Stroke Association. 2005.
<http://www.americanheart.org/downloadable/heart/1114880987205NationAtRisk.pdf>, accessed 8/27/07.
- ⁴ National Center for Health Statistics. Centers for Disease Control and Prevention. Prevalence of Overweight Among Children and Adolescents: United States, 2003-2004. 2007. Available at: http://www.cdc.gov/nchs/products/pubs/pubd/hestats/overweight/overwght_child_03.htm, accessed 8/27/07.
- ⁵ Centers for Disease Control and Prevention. Overweight and Obesity: Childhood Overweight: Overweight Prevalence. 2007. <http://www.cdc.gov/nccdphp/dnpa/obesity/childhood/prevalence.htm>, accessed 8/27/07.
- ⁶ Mei Z, Grummer-Strawn LM, Scanlon KS. Does Overweight in Infancy Persist Through the Preschool Years? An Analysis of CDC Pediatric Nutrition Surveillance System Data. *Soz. Praventivmed.* 2003;48:161-7
- ¹ Ogden CL, Carroll MD, Curtin LR, McDowell MA, Tabak CJ, Flegal KM. Prevalence of Overweight and Obesity in the United States, 1999-2004. *JAMA.* 2006;295:1549-1555.
- ⁷ Centers for Disease Control and Prevention. Overweight and Obesity: Childhood Overweight: Contributing Factors. 2007.
http://www.cdc.gov/nccdphp/dnpa/obesity/childhood/contributing_factors.htm, accessed 8/27/07.
- ⁸ Whitaker RC, Orzol SM. Obesity Among US Urban Preschool Children; Relationships to Race, Ethnicity, and Socioeconomic Status. *Arch Pediatr Adolesc Med.* 2006;160:578-584.
- ⁹ Kimbro RT, Brooks-Gunn J, McLanahan S. Racial and Ethnic Differentials in Overweight and Obesity Among 3-Year-Old Children. *Am J Public Health.* 2007;97:298-305.
- ¹⁰ Rose D, Bodor JN. Household Food Insecurity and Overweight Status in Young School Children: Results From the Early Childhood Longitudinal Study. *Pediatrics.* 2006;117: 464-473.

¹ Li N, Strobino D, Ahmed S, Minkovitz CS. Is There a Healthy Foreign Born Effect for Childhood Obesity in the United States? *Matern Child Health J.* 2010 March 14. Epub.

- ¹¹ Casey PH, Simpson PM, Gossett JM, Bogle ML, Champagne CM, Connell C, Harsha D, McCabe-Sellers B, Robbins JM, Stuff JE, Weber J. The Association of Child and Household Food Insecurity with Childhood Overweight Status. *Pediatrics*. 2006;118:e1406-13.
- ¹² Alaimo K, Olson Cm, Frongillo EA. Low Family Income and Food Insufficiency in Relation to Overweight in US Children: Is There A Paradox? *Arch Pediatr Adolesc Med*. 2001;155:1151-1167.
- ¹³ Warner ML, Harley K, Bradman A, Vargas G, Eskenazi B. Soda Consumption and Overweight Status of 2-Year-Old Mexican-American Children in California. *Obesity*. 2006;14:1966-1974.
- ¹⁴ Duerksen SC, Elder JP, Arredondo EM, Ayala GX, Slymen DJ, Campbell NR, Baquero B. Family Restaurant Choices Are Associated with Child and Adult Overweight Status in Mexican-American Families. *J Am Diet Assoc*. 2007;107:849-853.
- ¹⁵ Ariza AJ, Chen EH, Binns HJ, Christoffel KK. Risk Factors for Overweight in Five- to Six-Year-Old Hispanic-American Children: A Pilot Study. *J Urban Health*. 2004;81:150-161.
- ¹⁶ Melgar-Quiononez HR, Kaiser LL. Relationship for Child-Feeding Practices to Overweight in Low-Income Mexican-American Preschool-Aged Children. *J Am Diet Assoc*. 2004;104:1110-1119.
- ¹⁷ Barcenas CH, Wilkinson AV, Strom SS, Cao Y, Saunders KC, Mahabir S, Hernandez-Valero MA, Forman MR, Spitz MR, Bondy ML. Birthplace, Years of Residence in the United States, and Obesity Among Mexican-American Adults. *Obesity*. 2007;15:1043-1052.
- ¹⁸ Kaiser LL, Melgar-Quiononez HR, Lamp CL, Johns HC, Marwood JO. Acculturation of Mexican-American Mothers Influences Child Feeding Strategies. *J Am Diet Assoc*. 2001;101:542-547.
- ¹⁹ Singh GH, Yu SM. Adverse Pregnancy Outcomes: Differences Between US- and Foreign-Born Women in Major US Racial and Ethnic Groups. *AM J Public Health*. 1996;86:837-843.
- ²⁰ Fuentes-Afflick E, Lurie P. Low Birth Weight and Latino Ethnicity: Examining the Epidemiologic Paradox. *Arch Pediatr Adolesc Med*. 1997;151:665-674.
- ²¹ Collins JW, Martin CR. Relation of Traditional Risk Factors to Intrauterine Growth Retardation Among United States-born and Foreign-born Mexican Americans in Chicago. *Ethn Dis*. 1998;8:21-25.
- ²² Dubois L, Girard M. Early Determinants of Overweight at 4.5 Years in a Population-Based Longitudinal Study. *International Journal of Obesity*. 2006;30:610-617.
- ²³ Goel MS, McCarthy EP, Phillips RS, Wee CC. Obesity Among US Immigrant Subgroups by Duration of Residence. *JAMA*. 2004;292:2860-2867.
- ²⁴ Kaplan MS, Huguette N, Newsom JT, McFarland BH. The Association Between Length of Residence and Obesity among Hispanic Immigrants. *Am J Prev Med*. 2004;27:323-326.
- ²⁵ Singh GK, Siahpush M. Ethnic-immigrant Differentials in Health Behaviors, Morbidity, and Cause-specific Mortality in the United States: An Analysis of Two National Data Bases. *Hum Biol*. 2002;74:83-109.
- ²⁶ Lauderdale DS, Rathouz PJ. Body Mass Index in a US National Sample of Asian Americans: Effects of Nativity, Years Since Immigration and Socioeconomic Status. *Int J Obes Relat Metab Disord*. 2000;24:1188-94. Erratum 2002;26:1521.
- ²⁷ Kandula NR, Kersey M, Lurie N. Assuring the Health of Immigrants: What the Leading Health Indicators Tell Us. *Annu Rev Public Health*. 2004;25:357-76.
- ²⁸ Abraido-Lanza AF, Chao MR, Florez KR. Do Healthy Behaviors Decline with Greater Acculturation? Implications for the Latino Mortality Paradox. *Soc Sci Med*. 2005;61:1243-1255.
- ²⁹ Federal Interagency Forum on Child and Family Statistics. *America's Children in Brief: Key National Indicators of Well-Being, 2007*. Available at: <http://www.childstats.gov/americaschildren/index.asp>, accessed 8/27/07.
- ³⁰ Capps R, Fortuny K. Immigration and Child and Family Policy. Urban Institute 2006; <http://www.urban.org/publications/311362.html>, accessed 6/1/07.
- ³¹ Cuzick J. A Wilcoxon-Type Test for Trend. *Stat Med*. 1985;14(4):87-9.
- ³² Larsen LJ. The Foreign-Born Population in the United States: 2003. Current Population Reports, P20-551, US Census Bureau, Washington, DC. 2004.