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SOCIOECONOMIC STATUS AND BODY MASS INDEX AMONG HISPANIC CHILDREN OF IMMIGRANTS AND CHILDREN OF NATIVES

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ABSTRACT

Objectives. We sought to determine whether the relationship of socioeconomic status with BMI among Hispanic children differs from that among non-Hispanic white children, and whether any observed differences depend on the generational status of Hispanic children.

Methods. Data from the Early Childhood Longitudinal Study Kindergarten Cohort were used to estimate linear growth curve models of children's initial BMI in kindergarten and change in BMI through fifth grade. SES was measured by logged household income and parental educational attainment (<HS, HS, some college, college+).

Results. The relationship between socioeconomic status of the parents and Hispanic children's BMI varies by the parental nativity status. Higher parental education was associated with a slower increase in BMI among non-Hispanic white children and Hispanic children of immigrants, but not among native Hispanic children. Income was positively associated with initial BMI among children of Hispanic immigrants. The association of income with BMI (initial and growth) among non-Hispanic whites did not differ significantly from the association for Hispanic children of natives.

Conclusions. The positive relationship between income and children's baseline BMI among Hispanic immigrant families might reflect the relationship in immigrant parents' country of origin.

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Hispanic children have been disproportionately affected by the obesity epidemic. For example, analyses of the 2003-2004 NHANES show that among children ages 6-11, 22.5% of Mexican-Americans versus 17.7% of non-Hispanic whites were classified as overweight (having a BMI >=95 percentile).[1] As of 2005, 19.7% of children in the United States were Hispanic, up from 17.1% in 2000 and 12.2 % in 1990.[2] The growing size and high-risk profile of the Hispanic child population has motivated efforts to identify the factors leading to overweight in this population.[3] One of the more puzzling findings is that socioeconomic status (SES) does not appear to have a consistent relationship with children's health outcomes such as overweight among Hispanics. In the United States and other more developed countries, lower SES—particularly parental education—is often tied to overweight/obesity among children although the relationship varies by race and ethnicity.[4-5] Yet Goldman et al., (2006) found no relationship between parental education and obesity among a sample of Los Angeles Mexican-American adolescents.[6] In another study, Wang et al., (2006) analyzed NHANES data of younger children (ages 2-9 years), finding a negative association between poverty and overweight among whites but no consistent association among Mexican-Americans.[7] Whitaker & Orzol (2006) found no relationship between obesity and maternal education, household income and children's food security among Hispanic three-year olds living in major U.S. cities. [8]

One possible reason no prior research has found a significant SES gradient among Hispanics is that little work has examined SES and BMI separately by the nativity status of the parents. Among Hispanic children, 60% have at least one immigrant parent.[9] Perhaps the association between SES and BMI does not differ between US-born Hispanic and US-born non-Hispanic white families. However, for children from immigrant families, the association could resemble the relationship observed in some Latin American countries, i.e. positive.[5, 10-11] For example, in a study of more than 10,000 children ages 5–11 in

Mexico, researchers found that children of mothers with no schooling were half as likely to be overweight as children of mothers with middle school or high school educations.[12]

Another possible reason no one has found an SES gradient among Hispanics is that parental education has typically been used as an indicator of SES rather than income.[13] In the United States, the relationship between income and educational attainment is weaker among Hispanic immigrants than natives.[14] Parental education may not have the same implications for immigrant children's health for immigrants as for natives, especially if parents' schooling took place outside the United States. Among immigrant families living in the United States, income may be a better measure of current SES. Alternatively, higher education among immigrant parents may be associated with acculturation to U.S. norms about healthy weight whereas higher income may not, in which case it may be that the education (but not income) relationship for immigrants is likely to resemble that of natives.

To test these ideas we analyzed nationally-representative longitudinal data to examine the independent associations of educational attainment and family income on the one hand and BMI on the other among three groups: non-Hispanic white children with U.S. born parents, Hispanic children with U.S. born parents, and Hispanic children with at least one foreign-born parent.

METHODS

Sample

We used the Early Childhood Longitudinal Survey Kindergarten Class of 1998-99 (ECLS-K).[15] Conducted by the National Center for Education Statistics, the ECLS-K followed a nationally representative sample of children from kindergarten through fifth grade. Data were collected in kindergarten, and first, third and fifth grades (4 waves). We used information from the child (BMI) and parent questionnaires from all four waves.

Of the original 21,409 children in the ECLS-K, 4,745 were omitted from the analysis because of missing information on parental nativity status, base year socioeconomic status, or because they did not have at least one valid BMI measure. Any respondents with BMI scores classified as outliers by the CDC

growth charts were also omitted from the analysis. The analytic sample was further limited to non-Hispanic white children with native-born parents and all Hispanic children. The final analytic sample included a record for each wave a child was followed by the ECLS-K (N = 54,347 observations; 41,223 contributed by non-Hispanic white children, 8,183 by Hispanic children with at least one foreign-born parent, and 4,941 by Hispanic children with US born parents).

Measures

BMI/Obesity. Children's height and weight were assessed by ECLS-K staff at each wave using a Shorr Board and a digital scale. Raw BMI score was used rather than BMI z-score or percentile ranking because raw BMI score is optimal for measuring adiposity change.[16] The unweighted average BMI across all observations was 17.5, with a standard deviation of 3.4. The mean BMI for each group under study was 18.3, 17.8, and 17.3 for Hispanic children from immigrant families, Hispanic children from native families, and non-Hispanic white children from native families, respectively.

Socioeconomic Status (SES). Both family income (log transformed) and the highest level of education of parents or the responsible adult in the household (<high school, some college and college+ versus high school graduate) were used as indictors of socioeconomic status. Family income and parental education were assessed at the baseline interview and treated as non-time-varying because analyses (not shown) indicated little variation in parental education or income over the duration of the data collection. Almost 90 percent of the parents in the sample graduated from high school and nearly 60 percent attended "some college." Hispanic children were less likely to have parents who attended at least some college than non-Hispanic white children (30% of Hispanic children of immigrants and 52% of Hispanic children of natives versus 70% of non-Hispanic white children of natives). Fifty-seven percent of non-Hispanic white children lived in families with annual income over 50K compared with 38 percent of Hispanic children from native-born families, and 17 percent of Hispanic children from immigrant families. The zero-order correlation of logged family income and educational attainment (assessed in an OLS regression model predicting income as a function of the three education dummy variables) was .17 for

non-Hispanic white children of natives, .10 for Hispanic children of immigrants, and .19 for Hispanic children of natives.

Control variables. Control variables included gender (male=1, female=0); prematurity status (i.e., whether the child was born before 38 weeks of gestation), and the number of children in the household.

Analyses

Growth curve models were estimated to model baseline and growth in children's BMI using STATA Version 9.0 software.[17-18] The models simultaneously estimated effects for Level-1 units (the multiple observations for each child across age) and Level-2 units (the children). The Level-1 model fitted BMI as a function of age across the time observations for each child:

$$y_{ja} = \beta_{0j} + \beta_{1j}a_{ja} + \varepsilon_j,$$

where y_{ja} was the BMI of child j at age a (measured in months).

The Level-2 model fitted the Level-1 intercepts and coefficients across all individuals as a function of children's fixed characteristics:

$$\beta_{0j} = \gamma_{00} + \gamma_{01}E1_j + \gamma_{02}E3_j + \gamma_{03}E4_j + \gamma_{04}HI_j + \gamma_{05}HN_j + \gamma_{06}I +_j Z_j\delta_{0j} + \mu_{0j} \quad \text{(Model 1)}$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11}E1_j + \gamma_{12}E3_j + \gamma_{13}E4_j + \gamma_{14}HI_j + \gamma_{15}HN_j + \gamma_{16}I + \mu_{1j}$$

where *HI* and *HN* were dummy variables indicating Hispanic children of foreign-born or native-born parents, respectively;

I represents the log transformed family income from the base year;

$E1_j$, $E3_j$, and $E4_j$ were dummy variables indicating the highest educational attainment of the parent (less than high school, some college and college graduate, respectively), and Z_j was the vector of control variables.

The first equation (β_{0j}) estimated the associations of child-level factors with the children's baseline BMI in kindergarten (the "intercept" model), while the second equation (β_{1j}) estimated their associations with growth in BMI (the "slope" model). Tests for linearity showed that the effects of time were significantly nonlinear. However, because the results were consistent across both linear and non-

linear specifications of time (child's age in months), estimates from the simpler linear growth curve model are presented here.

To test the whether the effects of income (I_j) or education varied by parental nativity status (HI_j and HN_j), multiplicative interaction terms were added the model (e.g., the interaction terms involving income and parental nativity are $I_j.HI_j$ and $I_j.HN_j$). Significant main effects for education and income indicated significant effects for the reference category (i.e., non-Hispanic white children of natives), and significant interaction terms indicated that the relationship for Hispanic children of immigrants or natives differed significantly from that among the reference category. We tested the significance of the relationship of income and education for Hispanic children of immigrants and natives by rerunning the models while changing the reference category. To help interpret some of the findings, we generated predicted values by plugging into the models various values for income (the mean and one standard deviation above and below the mean) and ethnicity/nativity while setting the control variables to zero (thus the predicted values were generated for girls with no siblings who were not born prematurely whose parents are high school graduates). To further enhance interpretability, we multiplied predicted monthly change in BMI by 12 to obtain predicted annual growth in BMI.

RESULTS

Table 1 presents the intercept (β_{0j}) and slope (β_{1j}) coefficients for a series of three linear growth curve models. Model 1 was used to determine whether; net of parental education and family income, children's BMI differed by the nativity status of Hispanic parents. To test, we separated Hispanics into two groups—those with native born parents, and those with at least one foreign-born parent (hereafter known as children of native Hispanics and children of Hispanic immigrants). The reference category was non-Hispanic white children. On average, higher levels of education were associated with lower baseline BMI and less growth in BMI over time. Higher levels of family income were associated with slower growth in children's BMI. Net of education, income and controls, Hispanic children (regardless of parental nativity status) had higher initial BMI and higher rates of BMI growth than non-Hispanic white

children. In addition, Hispanic children from immigrant families had higher baseline BMI than Hispanic children from native families (difference = .24, $p \leq 0.01$).

To test whether the relationship of income and parental education with children's BMI differed across nativity and ethnic groups, we added two sets of interactions; income with parental nativity status and parental education with parental nativity status (Model 2). In preliminary analyses, we estimated separate models, one including the income but not education terms and a second including the education but not income terms. Except where noted, the results did not differ substantively from the model that included the terms for income and education together. The relationship of education with baseline BMI among Hispanic children (immigrants and natives) was not significantly different from that among non-Hispanic white native children, among whom parental educational attainment was associated with lower initial BMI. However, the relationship of education with growth in BMI was significantly different across groups. Figure 1 depicts the predicted education gradients (based on Model 2) with respect to BMI growth, evaluated at group-specific average family income. Higher education was associated with a slower increase in BMI among non-Hispanic white children and Hispanic children of immigrants, but not among native Hispanic children, among whom the relationship of education with growth in BMI was not statistically significant.

Net of parental education, family income was not a significant predictor of BMI in Kindergarten among non-Hispanic whites, but was associated with slower BMI growth through fifth grade (this is seen by observing the main effects of income in Model 2). When education was not in the model, income was significant in both the baseline and growth model (results not shown). Also, the interactions of income with "child of Hispanic immigrant" with regard to initial and growth in BMI were significant and positive, indicating that the relationships of income with initial and growth in BMI were significantly more positive among children of Hispanic immigrants than among non-Hispanic white children of natives. Subsequent testing revealed that the Hispanic immigrant income effect on baseline (but not growth in) BMI (-.033 + .103= .071) was positive and marginally different from zero (p=.08). In other words, there was some indication that for the children of Hispanic immigrants, family income was

positively associated with higher initial BMI and was not associated with growth in BMI. The association of income with initial BMI and growth in BMI among non-Hispanic whites did not differ significantly from the effects for Hispanic children in native families.

Predicted BMI of income by parental nativity (based on Model 2) is shown in Figures 2a and 2b. The top panel presents the predicted baseline BMI for a range of income values—the group-specific mean family income and one standard deviation above and below the mean. The predicted slope of income was significantly different from zero for both Hispanic groups, but ran in the opposite direction from one another. Among Hispanic immigrant families, children's baseline BMI increased at higher income levels but the reverse was true for children from native Hispanic families, among whom higher income was associated with lower predicted BMI in Kindergarten. Thus although children from native Hispanic families did not exhibit the same pattern as non-Hispanic whites with regard to the effects of education on BMI, the two groups did resemble each other with regard to family income. The lower panel of Figure 2 presents the predicted values by income generated from the slope model. Among children of non-Hispanic whites and Hispanic children of natives, the predicted rate of growth in BMI slowed down as income increased, whereas among the children of Hispanic immigrants the relationship was not significantly different from zero.

DISCUSSION

There is great concern about the disproportionate prevalence of overweight among Hispanic children in the United States.[19] Hispanics now represent roughly 20% of children in the United States, so it is important to understand the factors that influence overweight and obesity in this population. Weak or nonexistent links between parental socioeconomic indicators and children's overweight is a common finding in the literature on Hispanic children's health. We suggest that associations between socioeconomic status and child overweight may have been masked by a lack of attention to the nativity status of the parents. We used nationally representative longitudinal data on children to model the effects of parental education and income on BMI and the change in BMI from kindergarten through fifth grade.

Importantly, we explored how family income and education combined with the nativity status of Hispanic parents influenced children's BMI.

Our results indicated that the effect of parental education on Hispanic children's BMI is better understood by disaggregating by parental nativity status. We found the expected relationship between parental education and children's BMI for non-Hispanic white children. Children living in families with college educated parents tended to have lower BMI in kindergarten and have much slower growth in BMI than children whose parents had less education. But the relationship between parental education and child overweight was different for Hispanic children in immigrant households compared to Hispanic children in native households. Among children of Hispanic immigrants, the relationship between parental education and baseline BMI and BMI growth resembled the pattern for non-Hispanic whites, among whom higher educational attainment was associated with lower baseline BMI and growth in BMI. But, we did not find a significant relationship between parental education and children's BMI among children of Hispanic natives.

Our results further suggested that is it important to examine the associations of both educational attainment and income on Hispanic children's BMI. Among children of Hispanic natives we found a strong negative effect of income on children's BMI in Kindergarten once education was controlled for, but a positive effect of income on children's baseline BMI among Hispanic immigrant families. The positive relationship might reflect the relationship in the immigrant parents' country of origin. In many Latin American countries, higher levels of income and education are associated with higher levels of obesity among children,[12, 20-22] and immigrant parents might carry with them the feeding practices associated with their income levels in their home countries.[6,19] But what then explains the positive relationship of education on baseline BMI among Hispanic children of immigrants? Education and income appear to operate in opposing directions on BMI in kindergarten among Hispanic children of immigrants. One idea is that education (but not income) is associated with acculturation toward upper-middle class white norms in the United States about healthy weight in children. Among Hispanics, higher income may translate into indulgent child feeding practices unless higher incomes are accompanied by

higher levels of education and associated U.S. upper/middle-class norms about children's weight. More research on the relationships of education and income with feeding practices and perceptions of healthy weight among Hispanic parents would be helpful.

Finally, what might explain the absence of an effect of parental education among the Hispanic children of natives? Income appears to operate in the same direction (i.e. negative) among children of native Hispanic families as it does in non-Hispanic white families. However, the absence of an effect of education among children of native-born Hispanics might suggest that factors other than parental education are important predictors of overweight in this population. For instance, this finding could be explained by the heterogeneous composition of the U.S. Hispanic population. Future research on children's BMI should not only address the issue of parental nativity status, but should examine the relationship between Hispanic subgroup and the relationship between SES and children's BMI. Another possibility is that the lack of relationship is simply a problem of small cell sizes (particularly for higher parental educational levels). The group differences in the relationship of education with growth in BMI are not very large in substantive terms and all operate in the same direction (even though the Hispanic native relationship is not significant).

The research presented here has limitations. A significant portion of the ECLS-K sample was dropped from the analyses due to missing data on parental place of birth. We suspect that the missing immigrant families were disproportionately poor and (possibly) of unauthorized status. Thus the analytic sample may under-represent the lower-end of the SES distribution among the children of immigrants. Although all analyses control for SES and other factors possibly associated with non-response on immigration-related questions, unmeasured correlates of both non-response and children's BMI may remain, thus biasing the results. Another limitation is that the data we used do not included measures of intergenerational economic mobility or parents' perceptions of healthy weight, and provide only limited detail about feeding practices and activity patterns (these items are available only for the fifth grade data). This limited our ability to evaluate some of our interpretations of the findings. In addition to limitations in the ECLS-K data, we note that the analyses would be enhanced had we also examined the relationships

of income, education and children's BMI in Mexico and other Latin American countries that tend to send immigrants to the United States, but this extends beyond the scope of our study. Nevertheless, these findings point to the possibility that the lack of an education gradient with respect to BMI among Hispanic children may be attributed to the large presence of immigrant parents among the U.S. Hispanic population.

REFERENCES

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.

2. U.S. Census Bureau; Census 1990 & 2000, American Community Survey 2005; generated by Kelly Balistreri; using American Factfinder; <http://factfinder.census.gov/>; (12 March 2007).

3. Flores GE, Fuentes-Afflick E, Barbot O, et al. The Health of Latino Children: Urgent Priorities, Unanswered Questions, and a Research Agenda. *JAMA* 288(1): 82-90.

4. Gordon-Larsen P, Adair LS, Popkin BM**.** Ethnic differences in physical activity and inactivity patterns and overweight status. *Obes Res*. 2002;10(3):141-9.

5. Sobal J , Stunkard AJ. (1989). Socioeconomic-status and obesity: A review of the literature. *Psychological Bulletin* 105: 260-275.

6. Goldman N, Kimbro RT, Turra CM, Pebley AR. Socioeconomic Gradients in Health for White and Mexican-Origin Populations. *Am J Public Health.* 2006: 96(12):2186-2193.

7. Wang Y, Zhang Q. Are American children and adolescents of low socioeconomic status at increased risk of obesity? Changes in the association between overweight and family income between 1971 and 2002. *Am J Cln Nutr*. 2006:84:707-16.

8. Whitaker RC, Orzol SM. Obesity among US urban preschool children: Relationships to race, ethnicity, and socioeconomic status. *Arch Pediatr Adolesc Med* 2006 160(6):578.584.

9. Glick, JE, Van Hook J. Forthcoming. Through Children's Eyes: Families and Households of Latino Children in the United States, edited by Havidán Rodríguez and Cecilia Menjivar. Springer.

10. Ivanovic D, Ivanovic R, Buitron C. Nutritional status, birth weight and breast feeding of elementary first grade Chilean students. Nutr. Rep. Int. 1987; 36:1347-1361.

11. Monteiro,CA, Conde,WL, Lu B , Popkin, BM. Obesity and Inequities in health in the developing world. *International Journal of Obesity,* 2004.28:1181-6.

12. Hernandez, B, Cuevas-Nasu L, Shamah-Levy T, Monterrubio E, Ramizez-Silva C, Garcia-Feregrino R, Rivera J, Supulveda-Amor J. Factors associated with overweight and obesity in Mexican school-age children: Results from the National Nutrition Survey 1999. 2003 *Salud pública de México,* 45 Supplement 4:S551-7.

13. Chen E, Martin A D, Matthews KA. Socioeconomic status and health: Do gradients differ within childhood and adolescence? *Social Science & Medicine.* 2006 62, 2161-2170.

14. Waters M. Eschbach K. Immigration and Racial and Ethnic Inequality in the United States. *Annual Review of Sociology* 21:419-46; 1995.

15. U.S. Department of Education, National Center for Education Statistics. *ECLS-K First through Fifth Grade Restricted-Use Data Files and Electronic Codebooks* (CD-ROM). (NCES 2006-033). Washington, DC.

16. Cole TJ, Faith MS, Pietrobelli A, Heo M. What is the best measure of adiposity change in growing children: BMI, BMI%, BMI z-score or BMI? 2005 *European Journal of Clinical Nutrition 59*, 419−425.

17 Raudenbush SW, Bryk AS. *Hierarchical linear models: Applications and data analysis methods.* 2d ed. 2002. Newbury Park, CA: Sage

18. Heo M, Faith MS, Mott JW, Gorman BS, Redden DT, Allison DB. Hierarchical linear models for the development of growth curves: An example with body mass index in overweight/obese adults. 2003. *Statistics in Medicine, 22*, 1911-1942.

19. U.S. Department of Health and Human Services. *Healthy People 2010*. 2nd ed. With Understanding and Improving Health and Objectives for Improving Health. 2 vols. Washington, DC: U.S. Government Printing Office, November 2000.

20. Popkin, BM. The nutrition transition and obesity in the developing world. 2002. *Journal of Nutrition.* 131, 871S-973S.

21. Ridaura R, Barquera S, Prado B, Rivera J. Preventing obesity in Mexican children and adolescents. (81-127). In *Joint U.S.-Mexico workshop on preventing obesity in children and youth of Mexican origin: Summary.*2007 Maria Oria and Kristen Sawyer, editors. Washington, DC: National Academy Press.

22. Wang, Y. Cross-national comparison of childhood obesity: the epidemic and the relationship between obesity and socioeconomic status. 2001. *Int. J. Epidemiol.* 30(5): 1129-1136.

23. Perreira KM, Harris KM, Lee D. Making It in America: High School Completion by Immigrant and Native Youth. 2006. *Demography*, *43*(3), 511-536.

24. Lahaie, C. Impact of Parental Involvement on the Gap in Kindergarten Math Scores between Children of Immigrants and Children of Natives. 2007. Paper presented at the 2007 Population Association of America Meetings, New York.

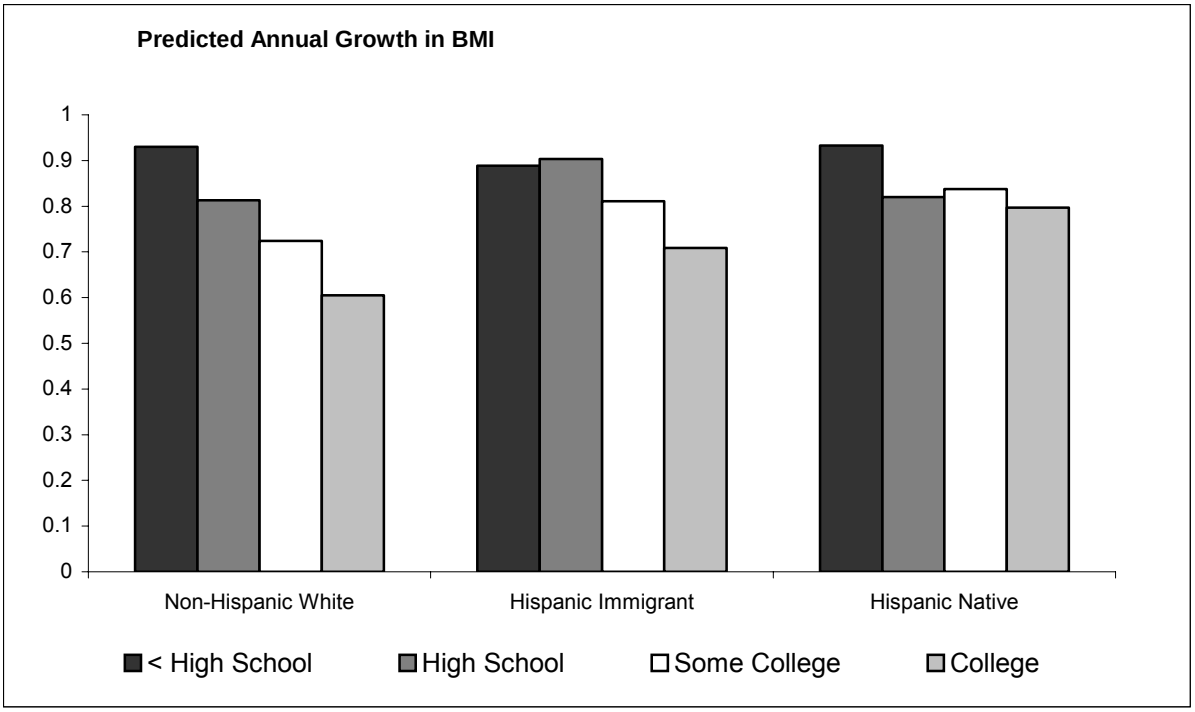
TABLE 1: Growth Curve Models of Body Mass Index (BMI) among Children Kindergarten through Fifth Grade

	Model 1		Model 2	
	Baseline BMI (β_{0j})	Growth in BMI (β_{1j})	Baseline BMI (β_{0j})	Growth in BMI (β_{1j})
Intercept	16.375 ***	0.091 ***	16.524 ***	0.104 ***
Education				
Less than HS	0.174 *	0.002	0.165	0.010 *
Some College	-0.031	-0.007 ***	-0.059	-0.007 ***
College	-0.201 ***	-0.017 ***	-0.210 ***	-0.017 ***
Income (ln)	-0.020	-0.002 ***	-0.033	-0.003 ***
Hispanic Children from Immigrant Household	0.552 ***	0.005 **	-0.527	-0.037 **
x Less than HS			0.100	-0.011 *
x Some College			0.078	0.000
x College			-0.042	0.001
x Income (ln)			0.103 *	0.004 **
Hispanic Children from a Native Household	0.318 ***	0.006 **	1.227	-0.019
x Less than HS			-0.310	0.000
x Some College			0.177	0.009 *
x College			0.244	0.015 **
x Income (ln)			-0.095	0.002

p<.001, ***; p<.01 **; p<.05, *
Reference category non-Hispanic white

Figure 1

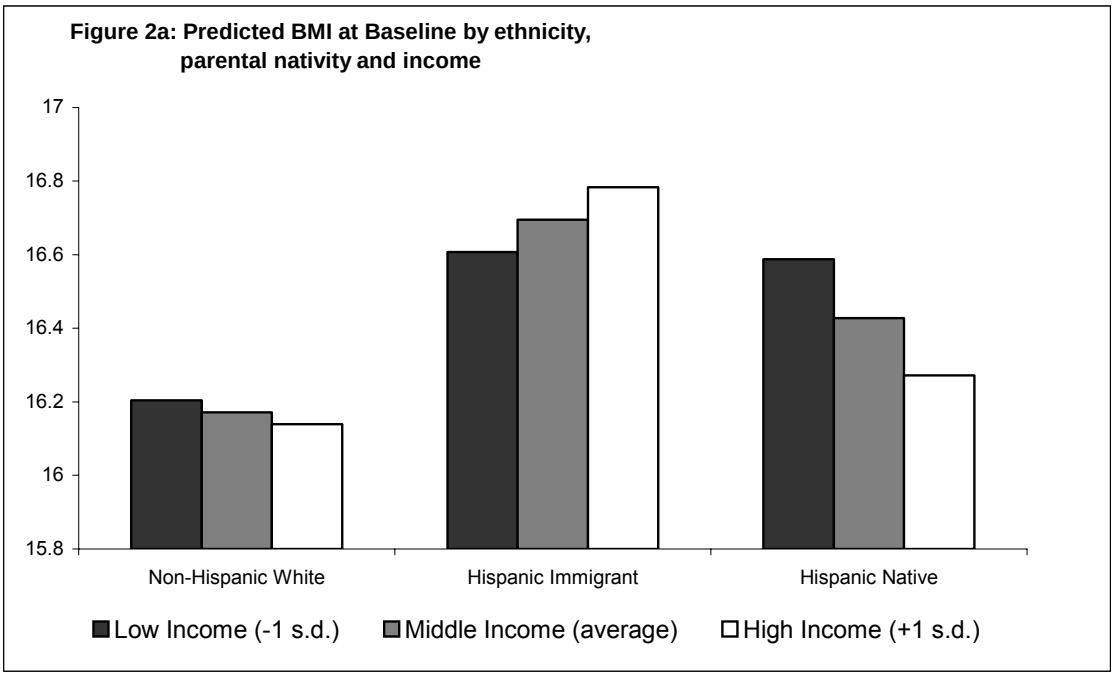
Predicted Baseline BMI and Annual Growth in BMI by Parental Education
for non-Hispanic White Children, Hispanic Children of Natives, and Hispanic Children of Immigrants

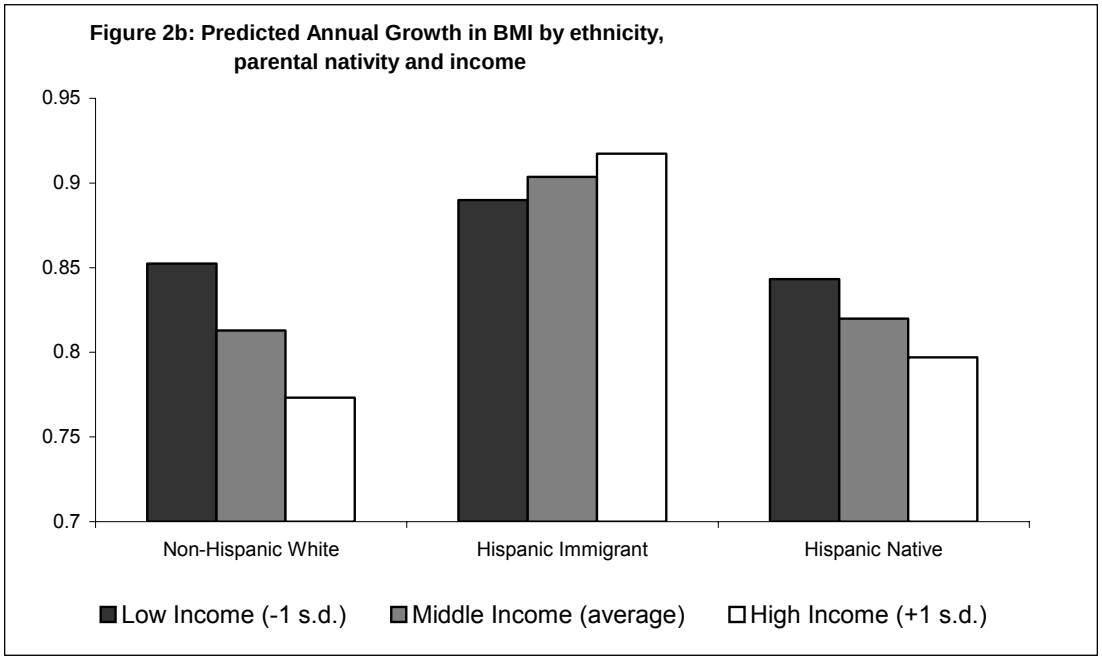


Note: Predicted values generated from Model 2, Table 1 are based on average family income, female child with no siblings.

Figure 2

Predicted Baseline BMI and Annual Growth in BMI by Low, Average and High Income
for non-Hispanic White Children, Hispanic Children of Natives, and Hispanic Children of Immigrants





Note: Predicted values generated from Model 2, Table 1 are based on parents with high school degree only, female child with no siblings.