Health and the Education of Children from Racial/Ethnic Minority and Immigrant Families*

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Building on a conceptual model of the transition to elementary school, this study explored the role of health in the early cognitive achievement of children from various racial/ethnic minority and immigrant families by applying multilevel modeling to data from a nationally representative sample of American kindergarteners. Whites tended to have the best physical health before transitioning to first grade. Children from immigrant Latino/a and Asian families had the worst physical health but the best mental health. Compared to white children from native families, these health differentials partially explained the lower math achievement and achievement growth of black children (whether from native or immigrant families) in first grade as well as the lower math achievement of children from Latino/a immigrant families and the lower achievement growth of children from Asian immigrant families during this period.

The transition to elementary school is a watershed event in the early life course, dramatically marking the movement of children from the private to public domain and laying an academic foundation that influences which students and student populations eventually excel or falter (Entwisle and Alexander 2002; Pianta and Cox 1999). Early advantages and disadvantages can compound over time, so that individual and group differences widen. In this way, the transition to elementary school is a ground zero for inequality and, as such, an ideal target for remedying it. The import of this transition is especially vivid when considering racial/ethnic and related forms of inequality because, as stratified as American society is along these lines, education is a powerful tool for both reducing and reinforcing such inequality (Lee and Burkham 2002).

This study, therefore, explores how race/ethnicity structures the transition to elementary school, paying special attention to immigrant distinctions within racial/ethnic populations. It does so by injecting health into a classic conceptual model from the sociology of education. Alexander and Entwisle's school transition model (1988) contends that social structural background differentiates children on early learning in large part through nonacademic differences in child development. Given the strong linkage of health to both background and academics (Currie 2005; Thies 1999), it could add value to this model. The greater amenability of health factors to interventions relative to other aspects of child development make their incorporation into the school transition model a potentially useful tool for crafting policy aimed at blocking educational inequality before it can compound.

Following this logic, this study is organized around two questions. First, how do children from various racial/ethnic and immigrant pop-

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ulations "stack up" on physical and mental health before first grade? Second, do these health differences translate into differential rates of achievement in core curricula by the end of first grade? Such research demonstrates the value of life course models of child development that leverage transition points and the interweaving of developmental domains (e.g., health, education) to understand developmental processes. It also has applied significance in that it documents societal inequality and points to potential health-focused methods—whole-student philosophies, school-linked services—of combating it.

THEORY AND EVIDENCE

Race/Ethnicity, Immigration, and Early Education

Fueled by differential rates of fertility and immigration, the racial/ethnic diversity of the United States increases every day. This diversity doubles as stratification, since non-white and non-native populations tend to be more socioeconomically disadvantaged (Hernandez 2004). Paradoxically, this disadvantage simultaneously impedes the educational progress of racial/ethnic minority children, especially immigrants, and dramatically increases the value of education in their lives. Children who successfully navigate the educational system despite this disadvantage vastly improve their chances for socioeconomic attainment. If such success proliferates, then racial/ethnic and related systems of social stratification will weaken over time (Glick and White 2003; Portes and Rumbaut 2001; Suarez-Orozco and Suarez-Orozco 2001; Kao 1999).

Given the cumulative nature of the educational system, what happens at the start of elementary school sets the stage for everything that comes later. For example, initial academic patterns are the most powerful predictors of eventual academic outcomes. Consequently, efforts to improve the educational trajectories of minority and immigrant youth will benefit by targeting the transition to elementary school (Entwisle and Alexander 2002; Pianta and Cox 1999). As described above, this study attempts such a goal by adding health to a classic sociological model of the transition to elementary school.

The Transition to Elementary School and Child Health

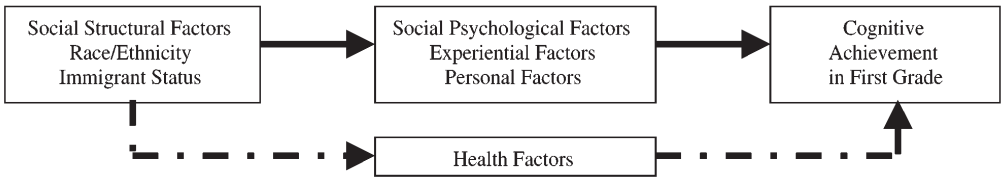
Derived from the life course paradigm, the school transition model elegantly uses child development to explain social structural differences in early cognitive achievement, differences that start off small but widen over time (Alexander and Entwisle 1988). It contends that the circumstances of children's lives when they enter school affect their readiness to learn. Those more ready are better able to engage early curricula, which builds knowledge and affects later class placements with cumulating effects on achievement. Because children from different social structural populations enter school with varying levels of readiness, they are set off on divergent educational trajectories that gain momentum from year to year. In other words, the transition to elementary school sets up an uneven playing field—what Lee and Burkham (2002) call "inequality at the starting gate"—with long-term consequences for societal inequality.

As seen in the solid-line path in Figure 1, the school transition model posits that different populations enter first grade with systematic differences in social psychological factors (e.g., interpersonal ties), experiential factors (e.g., extra-familial contexts), and personal factors (e.g., cognitive attributes). Because such factors predict achievement independent of initial intellectual competencies, these systematic differences then translate into corresponding differences in achievement and in growth in achievement over time.

This model has been a valuable tool for assessing the role of the elementary school transition in educational inequalities, including those related to race/ethnicity. I argue that this value would be enhanced by considering immigrant status in tandem with race/ethnicity. Race/ethnicity differentiates young people in terms of their social status, opportunities, and treatment. Immigration also entails a process of acculturation, by which young people and their parents must learn new rules about how American society works (Suarez-Orozco and Suarez-Orozco 2001). Thus, immigrant status is a variant of race/ethnicity, but it also has an additive effect on race/ethnicity in determining early educational experiences.

More importantly for the readership of this journal, I also argue that the value of the school transition model would be enhanced by

FIGURE 1. The Addition of Health to the School Transition Model



the incorporation of health (see dotted-line path in Figure 1) for three reasons. First, health, both physical and mental, is intertwined with other aspects of development. It affects, and is affected by, biological, social, and psychological aspects of children's lives, although it is often studied in isolation and rarely in relation to education (Roeser and Eccles 2000; Crockett and Petersen 1993). Second, research has linked health to race/ethnicity and immigrant status on the one hand and academic outcomes on the other, although rarely in the same model (Hernandez 2004; Thies 1999). Third, health is more policy-amenable than other developmental factors. For example, schools can incorporate health education and services more easily than large-scale policies can alter family dynamics (Takanishi 2004; Millstein 1988).

Health and the Math Achievement of Children from Diverse Families

The general goal of this study, therefore, is to demonstrate how physical and mental health link key aspects of social structural background (race/ethnicity, immigrant status) to early achievement above and beyond the established domains in the school transition model. Below, I provide a brief overview of prior research related to each of these linkages.

Beginning with physical health, non-white children typically arrive at elementary school with poorer physical health than their white peers. For example, demographic surveys have consistently shown that children and adolescents from racial/ethnic minority families rate themselves (and are rated by parents) as having poorer overall heath than their white counterparts (Bloche 2004; Hernandez 2004; Mendoza and Dixon 1999; Arcia 1998). In general, a similar pattern holds for specific health complications, such as obesity, diabetes, and other problems (Currie 2005; Ogden et al. 2002; Mendoza and Dixon 1999; Mendoza 1994; Earls 1993). Despite evidence of some specific immigrant health advantages in infancy and adolescence, these general racial/ethnic differences appear to be magnified for the young children of racial/ethnic minority immigrants (Takanishi 2004; Harris 1999; Mendoza and Dixon 1999).

Turning to mental health, whites generally score better than their peers from other racial/ethnic populations on measures of internalizing and externalizing symptoms, with some important exceptions, such as Asian American and Latino/a youth and problem behavior (Gee 2004; McLeod and Owen 2004; Hill, Bush, and Roosa 2003; McLeod and Nonnemaker 2000). Where immigration fits into this general pattern is more complicated. First, demographic analyses have revealed a slight tendency toward better psychological outcomes for immigrant youth than their native-born peers (Harker 2001). Second, smaller-scale research, including qualitative studies, has consistently demonstrated that Latino/a and Asian immigrant adolescents have better psychological adjustment and are less prone to conduct disorders than their native-born peers, mostly likely because of their stronger intergenerational ties (Valenzuela 1999; Fuligni 1998; Matute-Bianchi 1986). Thus, unlike physical health, observed racial/ethnic differences in mental health are likely to be weaker for children from immigrant families.

Certainly, health differentials are cause for concern for many reasons, but they take on added importance because of the linkage between health and early achievement. First, general poor health as well as acute problems (e.g., asthma, diabetes) complicate academic progress because they hamper brain development and disrupt class attendance, concentration, and participation (Currie 2005; Needham, Crosnoe, and Muller 2004; Thies 1999; National Education and Health Consortium 1992; Hagen and Kamberelis 1990). Indeed, the classic Perry Preschool Project identified

good health as fundamental to early learning precisely because feeling badly is such an academic distraction (Berrueta-Clement et al. 1984). Second, internalizing (e.g., depression) and externalizing (e.g., conduct disorder) problems have been linked empirically—in both community-based and national samples—to lower grades and test scores. Children with such problems have trouble doing their work, staying on task, connecting to others, and maintaining positive motivation. Moreover, externalizing problems increase social rejection. All of these factors lower readiness and ability to learn (Needham et al. 2004; Gutman, Sameroff, and Cole 2003; Field, Diego, and Sanders 2002; Roeser and Eccles 2000; Dishion, French, and Patterson 1995; Nolen-Hoeksema, Girgus, and Seligman 1986). Thus, poor health, whether physical or mental, is likely a risk factor for early cognitive achievement.

The conceptual model of this study ties together these strands by focusing on cognitive achievement in math, a core curriculum that structures the entire educational career (Lee and Burkham 2002). Racial/ethnic and immigrant differences in health are hypothesized to explain corresponding differences in math achievement in the first grade on top of the social psychological, experiential, and personal factors that are an established part of the school transition model as well as other elements of social structural background related to race/ethnicity and immigrant status (e.g., social class). Specifically, the poorer physical and mental health of racial/ethnic minority children relative to whites will predict lower levels of math achievement. Given that, within minority populations, immigrant children may have poorer physical but better mental health than others, the physical pathway in this model is expected to be more pronounced among children from immigrant families, and the mental health pathway is expected to be less so.

METHODS

Data

This study draws on a nationally representative data set of American kindergarteners collected by the National Center for Education Statistics (NCES). The Early Childhood Longitudinal Study–Kindergarten Cohort (ECLS–K) was created through a multistage sampling frame in which 22,782 students were nested within about 1,000 schools in about 100 counties. All students were enrolled in kindergarten at the first wave of data collection in the fall of 1998. Subsequent waves occurred in the spring of kindergarten, fall of first grade (25% subsample), and spring of first grade. Another follow-up in the spring of 2002 (third grade) has just been released. Data collection consisted of interviews with parents, teachers, and school administrators as well as diagnostic tests of children (see Denton and West 2002).

The analytical sample for this study consisted of all white, African American, Asian American, and Latino/a children who participated in data collection in the fall and spring of kindergarten and in the spring of first grade, had parents and teachers interviewed, and completed achievement tests (n = 14,901). Comparative statistics revealed that these selection criteria biased the sample slightly toward higher socioeconomic status, higher achievement, and better health. This bias, however, was not strong and, I argue, is outweighed by the value of using these longitudinal multisource data.

Measures

Descriptive statistics for all study variables are presented in Table 1.

Math achievement. At each data collection, children took timed tests in math that included items on conceptual knowledge, problem-solving, number properties, and measurement. Children took the first stage of the test and then, based on their performance, the low-, medium-, or high-difficulty stage. Item Response Theory allowed the development of proficiency scores across test sequences. This study used IRT scores from the fall of kindergarten and the spring of first grade. Screening identified some children whose English proficiency was too low to take these tests. Most were Spanish speakers who were then given Spanish language tests (a binary marker of assessment language was included in all analyses). No assessments were given to low-English-proficiency children who spoke languages other than Spanish, leading to a small bias in the Asian American subsample.

Physical health. This study considered two

TABLE 1. Descriptive Statistics for All Study Variables

	%	M	SD
Race/Ethnicity & Immigrant Status			
White native family	56.98	—	—
White immigrant family	2.68	—	—
Black native family	14.19	—	—
Black immigrant family	1.09	—	—
Latino/a native family	8.87	—	—
Latino/a immigrant family	8.19	—	—
Asian native family	2.10	—	—
Asian immigrant family	4.99	—	—
Control Variables		—	—
Gender (female)	49.10	—	—
Age (years)	—	6.23	.37
Timing of first-grade assessment	—	64.73	17.13
West	21.84	—	—
Northeast	18.59	—	—
South	34.58	—	—
Midwest	24.98	—	—
Small town/rural	21.48	—	—
Large city	39.33	—	—
City fringe/large town	39.19	—	—
Social Structural Factors			
Socioeconomic status	—	.04	.79
Family structure (two-parent)	67.62	—	—
Health care and coverage	—	2.61	.74
Social Psychological Factors			
Closeness with parent	—	3.69	.38
Home learning environment	—	2.72	.51
Parental physical health	—	3.85	.94
Parental depression	—	1.44	.45
Interpersonal functioning	—	2.99	.63
Experiential Factors			
No child care (parental care)[a]	16.20		
Preschool care as child care	32.56	—	—
Center care	6.64	—	—
Head Start program as child care	7.68	—	—
Relative child care	12.33	—	—
Non-relative child care	9.33	—	—
Other child care	4.42	—	—
Grade retention	3.83	—	—
Regular tutoring (first grade)	10.44	—	—
Private-school sector (first grade)	19.94	—	—
Teacher emphasis on math (first grade)	—	1.28	.74
Personal Factors			
Low English proficiency	13.89	—	—
Approaches to learning	—	3.00	.67
Child Outcomes			
Poor physical health	—	1.67	.81
Physical health problems	—	.40	.59
Internalizing symptoms	—	1.55	.51
Externalizing symptoms	—	1.65	.63
Math achievement (fall-kindergarten)	—	19.89	7.41
Math achievement (spring-first grade)	—	43.49	9.02

Notes: n = 14,901. All measures were created with kindergarten data unless otherwise noted.
[a] A binary marker for those missing child care information (11%) was also created for use as a control.

aspects of physical health, both measured in the fall of kindergarten. Poor physical health was a global rating, a common and valid technique in health research (Ferraro and Farmer 1999). Parent reports of the general health status of children (1 = poor, 2 = fair, 3 = good, 4 = very good, 5 = excellent) were reverse-coded so that higher values represented poorer health. For physical health problems, I followed the lead of adolescent health researchers in the immigration field (see Harris 1999) by counting moderately intercorrelated acute complica-

tions. I first converted children's interviewer-measured height and weight to a Body Mass Index (BMI). With the gender by age tables provided by the Centers for Disease Control and Prevention, I then created a binary measure of overweight status (1 = BMI at or above the 85th percentile for age and gender, 0 = BMI below this threshold). Next, parents reported whether their children had experienced frequent ear infections, untreated vision problems, or untreated hearing problems in the last year (1 = yes, 0 = no). These four binary items were summed to create a single scale ranging from 0 to 4. The two physical health measures were significantly, though weakly, correlated ($r = .17$, $p < .001$).

Mental health. In the fall of kindergarten, teachers completed a set of ratings about each child. The internalizing scale gauged the extent to which they observed signs of anxiety, loneliness, low self-esteem, and sadness. The externalizing scale gauged the extent to which they observed signs of acting-out behaviors, including instances in which the child argued, fought, got angry, acted impulsively, or disturbed others' activities (four-point scale for both, where 1 = never and 4 = very often). These two mental health measures were significantly correlated ($r = .30$, $p < .001$).

This use of teacher ratings deserves further comment. The ideal measurement of child mental health is professional evaluation or independent observation, methods which are often unfeasible in national-level data collection. Moreover, the self-reports typically used in national studies of adolescence (e.g., Add Health) are not appropriate for young children. Thus, adult reports are useful in national studies of children. Given the educational focus of ECLS-K, teachers were a logical choice. Yet teacher ratings have their own biases, since the teachers only observed children for limited times and may have been ill-equipped to judge the internal workings of children's minds, especially for children from different cultures. These teacher ratings, therefore, must be seen as a compromise in national-level research that are useful when presented with the appropriate caveats (Crosnoe 2005).

Race/ethnicity and immigrant status. Parents reported their own and their children's race/ethnicity and birthplace, which allowed the identification of the first generation (foreign-born), second generation (U.S.-born to foreign-born parents), and third-plus generation (U.S.-born children to U.S.-born parents) in various racial/ethnic populations. This information led to the creation of a set of eight mutually exclusive dummy variables: white native family, white immigrant family, black native family, black immigrant family, Latino/a native family, Latino/a immigrant family, Asian native family, and Asian immigrant family. In this set, "immigrant family" groups together all children of immigrants, which is appropriate because young children of the first and second generations do not differ as sharply in their length of time in the United States or in American schools as their adolescent counterparts (Suarez-Orozco and Suarez-Orozco 2001).

Social structural factors. The original school transition model was organized by several social structural factors, the most important of which were race/ethnicity and social class. Thus, this study created three factors tapping aspects of socioeconomic status in order to tease out the importance of the social structural factors of interest (race/ethnicity, immigrant status) to health and achievement, independent of the other key social structural factor. First, NCES created a continuous scale, ranging from –5 (low) to 3 (high), to measure socioeconomic status by taking the mean of five standardized items from the fall of kindergarten: father education (1 = 8th grade, 9 = postgraduate degree), father occupational status (self-reported occupations assigned prestige scores according to the General Social Survey method), mother education, mother occupation, and annual family income. Second, parents filled out a household roster in the fall of kindergarten, from which a binary measure of family structure (1 = two parents married and living together, 0 = other family arrangement) was created. Third, health coverage and care was a summed scale of three binary items from the spring of kindergarten (1 = yes, 0 = no), all based on parent reports in kindergarten: whether the child (1) was covered by a health insurance plan, (2) had visited a doctor in the last year for routine health care, and (3) had visited a dentist in the last year for routine care.

Social psychological factors. Interpersonal relations with parents and peers play a key role in the school transition model. ECLS–K allowed the creation of three factors in this vein with data from the fall of kindergarten. Parents assessed the truth on a four-point scale

of four statements concerning their relationships with their children (e.g., "My child and I often have warm, close times together," " I express affection by hugging, kissing, and holding my child"). These responses were averaged to create a scale of closeness with parent (a = .61). For home learning environment, I replicated a measure created by Magnuson and colleagues (2004) that consisted of the mean of seven items on the frequency (1 = not at all, 2 = once or twice a week, 3 = 3–6 times a week, 4 = every day) of various parent-child activities, such as artwork, playing games, singing songs, and nature lessons (a = .67). Interpersonal functioning was based on teacher assessments of children's relationship formation and maintenance, including their abilities to get along with others who were different, comfort or help others, express feelings in positive ways, and show sensitivity to others (four-point scale, where 1 = never and 4 = very often).

Two other measures—parent physical health and parent depression—did not map as cleanly onto the social psychological factors in the school transition model, but they were important to consider in this health-focused application of the model because they tap crucial elements of the family environment, potentially link race/ethnicity to child health, and represent potential spurious factors that, if omitted, could lead to overestimations of the link between child health and achievement (Currie 2005). Both measures were created with data from the spring of kindergarten. Parent physical health was self-rated (same response categories as child). Parent depression was based on a condensed version of the Center for Epidemiologic Studies–Depression (CES–D) scale (Radloff and Locke 1986). Parents reported how often, during the past week, they experienced 11 depressive symptoms, such as lost appetite, trouble sleeping, and fearfulness. Responses (1 = never, 2 = some of the time, 3 = a moderate amount of time, 4 = most of the time) were averaged to create the final scale (a = .85).

Experiential factors. Aspects of institutional settings and pathways related to early achievement were central to the school transition model, so this study constructed an elaborated set of such experiential factors. Parents reported the child care arrangements they used in the year before the start of kindergarten (dummy variables for none/parental, preschool, center care, Head Start, relative care, non-relative care, other/multiple, missing care information). With spring of first grade data, I created two binary markers: regular tutoring (1 = child currently receiving tutoring outside of school on a regular basis) and grade retention (1 = child had repeated kindergarten). Finally, spring of first grade reports of school administrators and teachers allowed the creation of a binary measure of school sector (1 = private, 0 = public) and teacher emphasis on math (0 = teacher expected students to spend no time on math homework each night, 1 = 10 minutes, 2 = 20 minutes, 3 = 30 minutes, 4 = 30+ minutes).

Personal factors. In the school transition model, personal factors tapped individual competencies and psychological characteristics related to academic and social functioning in school. This study created two measures to capture the essence of these personal factors: English language proficiency (measured with a binary item marking whether children failed the language proficiency test) and approaches to learning. This latter measure was based on teachers' assessments of each child's classroom skills, including concentration and attention (see Magnuson et al. 2004 for a more complete description).

Control variables. To account for additional sources of demographic and geographic variability, all analyses controlled for gender (1 = female, 0 = male), age, region (dummy variables for west, midwest, northeast, south), and urbanicity (dummy variables for large city, city fringe/large town, small town/rural). Also controlled was a measure of timing of assessment (measured in days from the start of assessment), since students who took the test later in the school year would have had more time to learn.

Plan of Analyses

The conceptual model of this study was tested in three stages. The first stage modeled the four health factors. Each health outcome was regressed on the race/ethnicity and immigrant status dummy variables and the control variables, followed by the inclusion of the social structural, social psychological, experiential, and personal variables. The second stage modeled absolute level of math achievement in the first grade. First grade achievement was regressed on the race/ethnicity and immigrant status dummy variables and the control variables, followed by the addition of

the four health factors and then the addition of the social structural, social psychological, experiential, and personal factors. The third stage modeled achievement growth by controlling for kindergarten math achievement in the first grade achievement model. These analyses were conducted with the mixed procedure in SAS, a type of multilevel modeling (Singer 1998). This procedure partitioned the variation in the dependent variable into between-school and within-school components, which corrected the design effects of ECLS-K (e.g., nonindependence due to school-based clustering), and also incorporated sampling weights to account for the unequal probability of selection of some groups (e.g., Latino/as) into the ECLS-K sample.

In addition to these analyses, I performed two ancillary exercises. First, children also took achievement tests in reading, but, unlike in math testing, all low-English-proficient children (Spanish-speaking or otherwise) were excluded from this test. I re-estimated all achievement models with the reading test score. Second, the health problems outcome was a count variable, and the two mental health outcomes were highly skewed. Consequently, I re-estimated the health problems model with poisson regression in STATA, and I then re-estimated the mental health models with logged versions of the two outcomes in SAS. Neither of these ancillary models produced results that differed in meaningful ways from those presented here.

RESULTS

Pre-transition Health

To assess the potential additive power of health to a school transition model of racial/ethnic and immigration-related differences in early math achievement, I first needed to establish health differences by race/ethnicity and immigrant status (see Table 2). Before discussing the results, I should note two things about the multilevel models in Table 2. First, these models did not contain the four experiential factors measured in first grade because they did not meet the required temporal ordering for models of kindergarten-measured health factors. Second, all models were presented with white as the reference category for the race/ethnicity and immigrant status dummy variables. Each model, however, was estimated eight times, one with each race/ethnicity and immigrant status dummy variable as the reference category, in order to assess the rank ordering of each group relative to all others.

Beginning with poor physical health, rotating the reference category for the race/ethnicity and immigrant status dummy variables revealed three ranks, from poorer health to better health: (1) children from Asian immigrant and Latino/a immigrant families; (2) children from black native, black immigrant, Asian native, and Latino/a native families; and (3) children from black immigrant, Asian native, Latino/a native, white immigrant, and white native families. In this ranking, populations appearing in more than one ranking (e.g., black immigrant children in the first and second rank) did not differ significantly from the populations in either rank and therefore bridged the two ranks. Other significant predictors of poor physical health were male status, age, urbanicity, low socioeconomic status, non-two-parent family, lack of closeness with parents, low home learning environment, poor parental health, parental depression, low English proficiency, and low approaches to learning.

Turning to physical health problems, the rank ordering of the racial/ethnic and immigrant populations was bifurcated: children from Latino/a immigrant families had more problems than all others. Before taking into account the significant social structural factors (low socioeconomic status), social psychological factors (low home learning environment, poor parental health, parental depression), experiential factors (center-based and non-relative care), and personal factors (low approaches to learning), most of the immigrant populations ranked much higher, but these apparent health disadvantages (relative to all whites) were eliminated by taking into account these other aspects of the school transition model.

Four populations had the highest level of internalizing symptoms: children from white native, black native, black immigrant, and Latino/a native families. Alternatively, two populations had the lowest: children from Asian immigrant and Latino/a immigrant families. Finally, two other populations—children from white immigrant and Asian native families—bridged these two ranks, each statistical-

TABLE 2. Results of Regression Models Predicting Health Outcomes in Kindergarten

	Physical Health				Mental Health			
	Poor Health		Health Problems		Internalizing		Externalizing	
	b	SE	b	SE	b	SE	b	SE
Race/Ethnicity & Immigrant Status								
White native family	—	—	—	—	—	—	—	—
White immigrant family	–.02	.04	.01	.03	–.04	.03	–.02	.03
Black native family	.08**	.03	–.01	.02	–.03*	.01	.11***	.02
Black immigrant family	.07	.07	.06	.05	.03	.04	.05	.05
Latino/a native family	.01	.03	.02	.02	–.02	.02	–.04*	.02
Latino/a immigrant family	.19***	.04	.10***	.02	–.09***	.02	–.07*	.03
Asian native family	.09	.07	–.03	.05	–.02	.04	–.06*	.03
Asian immigrant family	.30***	.05	–.01	.04	–.07***	.03	–.12***	.03
Control Variables								
Gender (female)	–.07***	.01	–.01	.01	.03**	.01	–.15***	.01
Age (years)	.09***	.02	.05***	.02	.01	.01	.01	.01
West[a]	—	—	—	—	—	—	—	—
Northeast	–.01	.04	.09**	.03	.03	.03	–.03	.03
South	.03	.03	.02	.03	.00	.02	.05	.02
Midwest	.03	.04	.01	.03	–.02	.03	–.02	.03
Small town/rural[a]	—	—	—	—	—	—	—	—
Large city	.06	.03	.01	.03	.03	.02	–.01	.03
City fringe/large town	.02	.03	.01	.03	.06*	.02	.04	.03
Social Structural Factors								
Socioeconomic status	–.07***	.01	–.04***	.00	–.01	.00	–.01	.01
Family structure (two-parent)	–.07***	.01	–.02	.01	–.09***	.01	–.13***	.01
Health care and coverage	.01	.01	.01	.01	–.01	.00	–.01	.01
Social Psychological Factors								
Closeness with parent	–.04*	.02	–.01	.02	–.01	.01	–.06***	.01
Home learning environment	–.04***	.01	–.03***	.01	–.01	.01	.01	.01
Parental physical health	–.18***	.01	–.04***	.00	–.03***	.01	–.02*	.00
Parental depression	.07***	.01	.04***	.01	.03*	.01	.01	.01
Interpersonal functioning	.00	.02	–.02	.01	–.09***	.01	–.30***	.01
Experiential Factors								
No child care (parental care)[a]	—	—	—	—	—	—	—	—
Preschool care as child care	–.01	.02	.03	.02	–.02	.01	.11***	.02
Center care	.03	.03	.09***	.03	–.01	.02	.28***	.03
Head Start program as child care	.03	.03	.01	.02	.04*	.02	.04*	.02
Relative child care	.04	.03	.07***	.02	.01	.02	.01	.02
Non-relative child care	–.03	.03	.01	.02	–.05**	.02	.10***	.02
Other child care	.06	.04	.06*	.03	–.01	.02	.14***	.03
Personal Factors								
Low English proficiency	.15**	.04	–.02	.04	.01	.03	.00	.04
Approaches to learning	–.06***	.02	–.06***	.01	–.16***	.01	–.17***	.01
Intercept	2.09***	.17	.10	.13	2.37***	.10	3.36***	.12
Δ 2 Res LL [b]	–777		–106		–1,133		–2,853	

* $p < .05$; ** $p < .01$; *** $p < .001$ (two-tailed tests)

Notes: n = 12,115

[a] Reference category for set of dummy variables (race/ethnicity, region, urbanicity, child care). Care dummy variables included a binary marker for those missing care information.

[b] Change calculated in relation to base model containing race/ethnicity and immigration status dummy variables and control variables only.

ly indistinguishable from the high and low ranks. Again, these ranks were somewhat more spread out before controlling for significant social structural (non-two-parent family), social psychological (poor parental health, parental depression, low interpersonal functioning), experiential (certain forms of non-parental child care), and personal (low approaches to learning) predictors of internalizing symptoms, with children from any type of black family scoring much higher on the internalizing scale than all other populations.

Lastly, the rank ordering of the various populations on externalizing symptoms went as

follows: (1) children from black native and immigrant families; (2) children from black immigrant, white native, and white immigrant families; (3) children from white immigrant, Latino/a native, and Asian native families; and (4) children from Latino/a and Asian immigrant families. The distinctions between the black children on one end of the spectrum and Asian and Latino/a immigrant children on the other was more pronounced before adding the significant social structural (non-two-parent family), social psychological (lack of closeness with parents, poor parental health, low interpersonal functioning), experiential (almost any form of non-parental care), and personal (low approaches to learning) predictors of externalizing symptoms.

Post-transition Cognitive Achievement in Math

According to the elaborated school transition model that frames this study, these racial/ethnic and immigration-related differences in health have potential implications for cognitive achievement during first grade. To assess these implications, I estimated multilevel models predicting first grade math achievement (see Table 3).

Controlling only for gender, age, region, and urbanicity (model 1), whites and Asians had the highest level of math achievement in first grade, outscoring children from the other populations by between three and six points on the math test. Children from Latino/a native families and black immigrant families ranked second, followed by children from Latino/a immigrant families and, finally, children from black native families. Model 2 added the four health factors. Children with worse physical and mental health in kindergarten had significantly lower math achievement. Converting these coefficients to standardized betas revealed that, of the four, internalizing symptoms was most strongly associated with later math achievement, followed by the other mental health factor, poor physical health, and physical health problems. Model 3 added the other social structural factors as well as the social psychological, experiential, and personal factors. Of these, family socioeconomic status, health care coverage, preschool enrollment, center-based care, private sector enrollment, teacher emphasis on math, and approaches to learning were all associated with higher achievement in first grade, while interpersonal functioning, Head Start enrollment, regular tutoring, grade retention, and low English proficiency were associated with lower achievement.

How did these additions of the original components of the school transition model affect the patterns related to health? First, these additions eliminated the previously observed association between externalizing symptoms and math achievement. Second, although the other three health coefficients remained statistically significant, they were each reduced in magnitude. Standardizing all of the coefficients indicated that the coefficient for internalizing symptoms was smaller than the coefficients for approaches to learning and family socioeconomic status, was roughly equivalent to the coefficients for regular tutoring and low English proficiency, and was greater than all other coefficients in the model. The magnitude of the two physical health predictors was much smaller but still equaled or exceeded the coefficients for health care and coverage, all significant forms of child care, private sector enrollment, and teacher emphasis on math. Third, I re-estimated the base model four times, each time adding one set of predictors, and then calculated the percent change in the magnitude of the race/ethnicity and immigrant status coefficients between the base model and each of these four models to determine the relative value of each set of factors in the school transition model.

Relative to whites (the group with the highest level of achievement), the coefficient for children from black native families was reduced 15 percent by the addition of the four health factors; this was lower than the percent change in this coefficient associated with the addition of the social structural factors (–26 percent) and personal factors (–23 percent) and roughly on par with the percent changes in this coefficient associated with the addition of the social psychological (–17 percent) and experiential (–18 percent) factors. The same basic pattern held for children from black immigrant families, except the percent change in this coefficient associated with the addition of the health factors exceeded the corresponding change associated with the additions of the social structural and experiential factors. Asian American children (whether from immigrant or native families) did not differ from native-

TABLE 3. Results of Regression Models Predicting Math Achievement in First Grade

	Model 1		Model 2		Model 3	
	b	SE	b	SE	b	SE
Race/Ethnicity & Immigrant Status						
White native family	—	—	—	—	—	—
White immigrant family	–.40	.46	–.63	.45	–.78*	.41
Black native family	–5.30***	.27	–4.59***	.26	–3.05***	.25
Black immigrant family	–3.46***	.75	–2.93***	.72	–2.46***	.65
Latino/a native family	–3.33***	.30	–3.18***	.29	–1.88***	.25
Latino/a immigrant family	–4.32**	.34	–4.21**	.33	–1.44**	.34
Asian native family	–.05	.71	–.18	.69	–.24	.62
Asian immigrant family	–.23	.59	–.56	.57	–1.37**	.52
Control Variables						
Gender (female)	–.19	.15	–.72***	.15	–1.51***	.14
Age (years)	3.49***	.21	3.46***	.21	3.36***	.21
West[a]	—	—	—	—	—	—
Northeast	–.84	.46	–.91*	.46	–1.39*	.39
South	–.21	.41	–.02	.39	.42	.35
Midwest	–.09	.44	–.13	.42	–.09	.38
Small town/rural[a]	—	—	—	—	—	—
Large city	.97*	.41	1.04**	.39	.68	.35
City fringe/large town	2.27***	.41	2.30***	.39	1.18***	.35
Timing of first grade assessment	.01	.01	.02**	.01	.05***	.01
Child Health						
Poor physical health	—	—	–.80***	.09	–.35***	.09
Physical health problems	—	—	–.65***	.12	–.28**	.11
Internalizing symptoms	—	—	–2.72***	.15	–1.31***	.14
Externalizing symptoms	—	—	–1.29***	.12	–.01	.12
Social Structural Factors						
Socioeconomic status	—	—	—	—	1.87***	.11
Family structure (two-parent)	—	—	—	—	.13	.16
Health care and coverage	—	—	—	—	.24*	.12
Social Psychological Factors						
Closeness with parent	—	—	—	—	–.08	.18
Home learning environment	—	—	—	—	.13	.13
Parental physical health	—	—	—	—	.12	.08
Parental depression	—	—	—	—	–.04	.15
Interpersonal functioning	—	—	—	—	–1.05***	.16
Experiential Factors						
No child care (parental care)[a]	—	—	—	—	—	—
Preschool care as child care	—	—	—	—	.68***	.21
Center care	—	—	—	—	.69*	.29
Head Start program as child care	—	—	—	—	–.76**	.29
Relative child care	—	—	—	—	–.16	.24
Non-relative child care	—	—	—	—	.40	.26
Other child care	—	—	—	—	–.10	.34
Grade retention	—	—	—	—	–1.32***	.35
Regular tutoring (first grade)	—	—	—	—	–2.88***	.22
Private school sector (first grade)	—	—	—	—	.94**	.34
Teacher emphasis on math (first grade)	—	—	—	—	.24**	.11
Personal Factors						
Low English proficiency	—	—	—	—	–4.15***	.49
Approaches to learning	—	—	—	—	4.67***	.15
Intercept	21.72***	1.49	29.69***	1.47	17.96***	1.73
Δ 2 Res LL	—		–702		–2,410	

* $p < .05$; ** $p < .01$; *** $p < .001$ (two-tailed tests)

Notes: n = 12,115. All measures were created with kindergarten data unless otherwise noted.

[a] Reference category for set of dummy variables (race/ethnicity, region, urbanicity, child care). Care dummy variables included a marker for those missing information.

born whites in math achievement. Thus, the health factors could not attenuate any association between the two Asian dummy variables and achievement.

This same analysis revealed a different pattern for Latino/a children. The addition of the health factors attenuated the coefficients for Latino/a native and immigrant family by less than 4 percent, dwarfed by the corresponding changes associated with the addition of the other sets of factors, especially the social structural and personal factors. Yet further analysis revealed that, for the children from Latino/a immigrant families, this small amount of attenuation masked two countervailing processes. The addition of the physical health factors, in which these children were previously reported to be disadvantaged, attenuated the association between Latino/a immigrant family and math achievement by nearly 20 percent, exceeding the corresponding change associated with the addition of the social psychological and experiential factors. Conversely, the addition of the mental health factors, in which these children were previously reported to be advantaged, increased the coefficient for Latino/a immigrant family by roughly the same amount.

Post-transition Growth in Cognitive Achievement in Math

The models just described examined absolute differences between racial/ethnic and immigrant populations in first grade math achievement. Recall that a key focus of the original formulation of the school transition model was growth in achievement; in other words, the change in achievement after some baseline level of achievement was established. Following this approach, the three models in Table 4 replicated those presented in Table 3 except that they also controlled for math achievement as measured at the very start of kindergarten.

The results for model 1 in Table 4 were similar to results for the corresponding model in Table 3 with two exceptions: (1) children from Asian immigrant families, who were among the highest achievers in first grade, ranked below the top group (all white children and those from Asian native families) in achievement growth, and (2) children from Latino/a families (immigrant or native) ranked somewhat higher in achievement growth than all populations but those in the top category. Thus, children from Asian immigrant families tended to have high achievement but moderate growth, while Latino/a children had lower achievement but greater gains over time.

Adding the four health factors revealed that poorer health predicted lower achievement growth from year to year, with internalizing symptoms again the most important of the four (model 2). Accounting for the other four components of the school transition model attenuated these health coefficients (model 3). Unlike the corresponding model in Table 3, however, externalizing symptoms remained a significant predictor of achievement growth in the final model. Other significant predictors of growth were socioeconomic status, lower interpersonal functioning, parental care (relative to Head Start and other child care), avoidance of grade retention, not accessing tutorial services, teacher emphasis on math, English proficiency, and approaches to learning. The magnitudes of the four health coefficients relative to these other aspects of the school transition model were roughly the same as what was reported for the corresponding model in Table 3. Thus, children in poor health demonstrated downward trajectories of achievement at the start of elementary school, and the risks of poor health cumulated.

Again, I performed additional analyses to evaluate the relative contributions of the different components of the school transition model to achievement growth. First, health explained roughly 11 percent of the associations with math achievement of children from both black native and black immigrant families, a level of attenuation that exceeded or equaled the other four sets of predictors. Second, health did not account for a meaningful portion of the associations between either of the two Latino/a variables and growth in math achievement, and this pattern did not change when physical and mental health were examined separately. Third, the health factors accounted for 8 percent of the association between Asian immigrant family and growth in math achievement, a level of attenuation below the social structural, social psychological, and personal factors. Almost all of this health attenuation was accounted for by physical health. Indeed, when mental health was examined separately, the association between Asian immigrant family and growth in

TABLE 4. Results of Regression Models Predicting Change in Math Achievement Between Kindergarten and First Grade

	Model 1		Model 2		Model 3	
	b	SE	b	SE	b	SE
Race/Ethnicity & Immigrant Status						
White native family	—	—	—	—	—	—
White immigrant family	–.09	.36	–.21	.37	–.32	.35
Black native family	–2.52***	.21	–2.26***	.21	–1.93***	.21
Black immigrant family	–1.93***	.58	–1.70***	.57	–1.73***	.56
Latino/a native family	–.98***	.23	–1.00***	.23	–.75***	.22
Latino/a immigrant family	–.56*	.27	–.65*	.27	–.23	.29
Asian native family	–.11	.55	–.17	.55	–.18	.53
Asian immigrant family	–1.37***	.46	–1.49***	.46	–1.71***	.44
Control Variables						
Gender (female)	–.32**	.12	–.60***	.12	–.98***	.12
Age (years)	–.28	.17	–.15	.17	–.12	.18
West[a]	—	—	—	—	—	—
Northeast	–1.61***	.44	–1.63***	.34	–1.72***	.33
South	–.03	.30	–.06	.30	.21	.29
Midwest	–.15	.33	–.16	.32	–.08	.32
Small town/rural[a]	—	—	—	—	—	—
Large city	.32	.31	.36	.30	.46	.30
City fringe/large town	.63*	.31	.70*	.30	.75	.30
Timing of first grade assessment	.02***	.00	.02***	.00	.04***	.00
Math achievement (fall-kindergarten)	.81***	.01	.78***	.01	.67***	.01
Child Health						
Poor physical health	—	—	–.37***	.07	–.22***	.07
Physical health problems	—	—	–.31***	.10	–.18*	.09
Internalizing symptoms	—	—	–1.09***	.12	–.66***	.12
Externalizing symptoms	—	—	–.76***	.10	–.21*	.11
Social Structural Factors						
Socioeconomic status	—	—	—	—	.67***	.10
Family structure (two-parent)	—	—	—	—	–.06	.14
Health care and coverage	—	—	—	—	.10	.11
Social Psychological Factors						
Closeness with parent	—	—	—	—	–.02	.16
Home learning environment	—	—	—	—	–.02	.11
Parental physical health	—	—	—	—	.07	.07
Parental depression	—	—	—	—	.01	.13
Interpersonal functioning	—	—	—	—	–.48***	.13
Experiential Factors						
No child care (parental care)[a]	—	—	—	—	—	—
Preschool care as child care	—	—	—	—	–.18	.17
Center care	—	—	—	—	–.06	.25
Head Start program as child care	—	—	—	—	–1.10***	.24
Relative child care	—	—	—	—	–.30	.21
Non-relative child care	—	—	—	—	–.04	.22
Other child care	—	—	—	—	–.60*	.29
Grade retention	—	—	—	—	–1.46***	.34
Regular tutoring (first grade)	—	—	—	—	–1.18***	.19
Private school sector (first grade)	—	—	—	—	.08	.29
Teacher emphasis on math (first grade)	—	—	—	—	.18+	.10
Personal Factors						
Low English proficiency	—	—	—	—	–2.83***	.42
Approaches to learning	—	—	—	—	2.16***	.13
	—	—	—	—		
Intercept	28.89***	1.15	32.34***	1.16	26.24***	1.48
Δ2 Res LL	—		–226		–740	

* $p < .05$; ** $p < .01$; *** $p < .001$ (two-tailed tests)

Notes: n = 12,115. All measures were created with kindergarten data unless otherwise noted.

[a] Reference category for set of dummy variables (race/ethnicity, region, urbanicity, child care). Care dummy variables included a marker for those missing information.

math achievement was actually about 20 percent stronger.

CONCLUSION

Health and education are two primary foci of research on children and youth. For too long, these two rich areas of research have talked past each other, but investigating the connections between the two could advance understanding of human development as well as larger societal issues, such as racial/ethnic and related forms of inequality (Currie 2005). We have certainly seen the value of such integrative approaches in adult-focused research (see Mirowsky and Ross 2003), and the same benefits could be realized in child-focused research, especially during a period in history witnessing major increases in the racial/ethnic diversity, partially fueled by immigration, of the child population in the United States A logical place to start such an integration is the incorporation of health into an existing school transition model focusing on race/ethnicity and immigration status, which was the general aim of this study. The results of this strategy did not always align with expectations, but they were quite telling.

In terms of pre-first grade health differentials, white children tended to have better physical health than their non-white peers, although these distinctions were not nearly as sharp or consistent as expected. At the same time, however, white children typically fell in the middle on mental health during this period, better than black children but often worse than other children. In general, the two populations with the poorest physical health and best mental health were Latino/a and Asian children from immigrant families. Thus, for physical health, a partial white advantage was coupled with a partial immigrant disadvantage, and, for mental health, a clear black disadvantage was coupled with a partial immigrant advantage. In terms of the role of pre-first grade health differentials in corresponding differentials in early math achievement, health equaled the other components of the school transition model in its contribution to the lower achievement and achievement growth in math of black children (whether from native or immigrant families) compared to whites. Moreover, health—at least physical health—exceeded other, more established components of the school transition model in its contribution to the lower achievement of children from Latino/a immigrant families relative to whites and to the lower achievement growth of children from Asian immigrant families relative to whites.

Based on these results, did health provide additive value to the school transition model? The answer is a qualified "yes." Health added predictive power to the explanation of achievement differentials for all black children, regardless of immigrant status, and it rivaled other aspects of the school transition model for the achievement of children from Latino/a immigrant and Asian immigrant families, with physical health contributing to such differences and mental health actually suppressing them. In no case did health overwhelm the other factors in the model, but it did usually "hold its own." The only exceptions to this general rule were children from Latino/a and Asian native families, the latter because math achievement was already high, the former likely because nativity countered race/ethnicity in health disparities with whites.

These general patterns subsume some important nuances. For example, the balance of the white vs. non-white comparison varied sharply by the aspect of health being described. Certainly, whites did not enjoy a general health advantage, and certainly no minority group exhibited a clear disadvantage either. Adding immigrant status to the mix doubtlessly blurred the distinctions between groups, with immigrant patterns and racial/ethnic patterns interacting in complicated ways. Thus, immigrant status was more than a variant of race/ethnicity; instead, it was a qualifier that strengthened or weakened racial/ethnic disparities. As another example, the real value of bringing in immigrant status was seen only for the two primary immigrant populations in the United States: Latino/as and Asians. These two populations demonstrated sharp differences by immigrant status, with children from immigrant and native families all but flip-flopping on physical and mental health. For these "new" populations, more so than for whites or blacks, the qualifier of immigration and nativity was more distinct. As a final example, a good deal has been written about Latino/a children's struggles in school as well as Asian children's successes in school. The results of this model revealed that children from Latino/a immigrant families would be faring even worse if not for the protective

nature of their mental health and that children from Asian immigrant families would be faring even better if not for the risky nature of their physical health.

The implications of this line of research are twofold. On a conceptual level, life course approaches to human development have great potential for health research. By connecting health to other domains of child development at transition points that are critical to the origins, accumulation, and reinforcement of societal inequalities, this study demonstrated ways that health can be better utilized by sociological research not traditionally associated with health and can be approached from different angles within the health field itself.

On a more applied level, this study has demonstrated that health is an appropriate focus of policy aimed at reducing demographic inequalities in education. Health was not the strongest predictor of achievement in this study, nor was it the primary mechanism linking race/ethnicity and immigrant status to achievement, but it has a quality that many other important factors do not. Namely, it is amenable to policy intervention. Of course, the best method of reducing inequalities in health is to combat the structural disadvantages faced by different minority populations, which is a difficult and often politically inexpedient task. Yet, while possibly entailing less dramatic effects, health can also be targeted directly. For example, although health is not a part of the formal mission of the educational system, health education (e.g., for students, for adults linked to adult services) and services (e.g., public vaccinations, public insurance programs, emotional counseling) have been incorporated into many schools. Most services likely need to be improved or reorganized, but they could be the building blocks for programs seeking to address the nonacademic origins of academic problems in different populations (Ma 2000; Millstein 1988). Although implementing such programs is not easy, it would be easier to do on a national scale than altering children's personalities or intra-family relationships or than alleviating structural and systemic inequalities. Health would be only one aspect of academic intervention, but such an intervention may prove to be beneficial and feasible in the long run (Currie 2005; Takanishi 2004).

Of course, this line of research must be advanced and refined in various ways before truly informing such initiatives. First, this study linked race/ethnicity (and immigrant status) to health, and health to early achievement. The next step is to elucidate the actual mechanisms underlying these linkages. Second, this study focused on a key transition point that has been demonstrated to be a foundation of long-term trajectories as well as of societal inequalities, but a longer-term perspective is in order. How are health and achievement trajectories related to each other over time for different populations? Do the apparent early advantages and disadvantages associated with health gain strength or fade away over subsequent years and school transitions? Third, ECLS–K has rich educational data, but its health data are less extensive. This line of research needs to draw on more detailed information on specific physical conditions (e.g., asthma, diabetes) than was available here. This line of research also needs to find mental health data not based on the reports of a non-neutral observer, given that the teacher reports used here support the suggestion that teachers are biased towards positive assessments of immigrant children's behavior and personality (see Valenzuela 1999). Fourth, establishing causality should be a major goal of future research. The associations between health and education reported in this study were correlational, even when lagged models were used, and more rigorous testing of these associations is needed.

Such future research is certainly important. Education is a high-stakes game in contemporary American society, perhaps the crucial determinant of long-term success (Suarez-Orozco and Suarez-Orozco 2001). Thus, the future of racial/ethnic and immigration-related inequality and equality is predicated on our ability to solve early population-level differences in educational trajectories. Considering how education is wrapped up with other aspects of child development, such as health, is a step in this direction.

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