THE EVOLUTION OF EDUCATION-HEALTH GRADIENTS ACROSS LATINO IMMIGRANT GENERATIONS

INTRODUCTION AND OVERVIEW

The enduring significance of education-health gradients has led to a large and still growing literature on the topic (Cutler and Lleras-Muney 2008, Lutfey and Freese 2006, Link and Phelan 1995). Yet, our understanding of education-health gradients is disproportionately small compared to the amount of research on the topic. As a result, scholars are increasingly interested in the *processes* by which these gradients evolve over the life course. Only a trickle of research fully interrogates these processes, however (Haas 2006, Baum and Ruhm 2007, Palloni et al. 2009, Warren 2007, Kane Buher et al. 2017). This body of work remains underdeveloped even as calls for these sorts of analyses amplify (e.g., Graham 2002, Palloni 2006, Osypuk 2013).

One unresolved line of inquiry in research on the evolution of education-health gradients is the extent to which a similar process produces observed education-health gradients across key demographic groups. Most research has focused on aggregate life course processes, pooling across demographic groups. Yet, race-ethnic and immigrant group differences—particularly paradoxical ones in which standard relationships between education and health do not operate—can provide critical insight into differences in the production of these gradients and potential policy interventions to improve the health of less advantaged groups that do not similarly enjoy better than expected health.

The Latino health paradox appears to be just such an exception. The well-established positive relationship between education and health is attenuated in this population, particularly among Latino immigrants (e.g., Acevedo-Garcia & Bates 2008, Palloni and Morenoff 2001,

Jasso et al. 2004, Palloni and Arias 2004).[1] But, this paradox is an ephemeral one. Second and third-generation Latinos, that is, Latinos born in the U.S. to immigrant and native parents (respectively), do not enjoy the same health advantages as their foreign-born counterparts who emigrate to the U.S. at an early age (generation 1.5) or as adults (generation 1.0).

I revisit paradoxical education-health gradients among Latinos to better understand the evolution of education-health gradients across the life course given noted variation between native-born white and Latino immigrant generations in these relationships. To the extent that education-health gradients are weaker at some points in the life course than others and/or these gradients strengthen at some (other) points across Latino immigrant generations, we have stronger evidence of critical periods in the development of these gradients and how these gradients generally operate (Heckman and Conti, Cuhna and Heckman 2008). I evaluate the evolution of education-health gradients using a longitudinal structural model that specifies the variable, complex relationships between education and health from childhood through young adulthood for a large, national sample of individuals. I frame my analysis using cumulative advantage theory. Cumulative advantage theory emphasizes persisting (dis)advantages over the life course that lead to increased group differences (Merton 1968, DiPrete and Eirich 2006, O'Rand 1996). A cumulative perspective across the life course is particularly important for highlighting emergent, complex relationships between earlier risk factors and later risk factors and health.

I have three main aims in my analysis.

[1] The immigrant health paradox operates not only among Latinos but other race-ethnic groups as well (e.g. Arthur and Katkin 2006). I focus on the Latino immigrant health paradox here given it is the most studied such paradox. Research also alternately specifies this paradox as differences in the relationship between education and health across immigrant and native-born groups or as differences in the mean level of health across immigrant and native-

First, I describe the overall, developmental process driving education-health gradients for native-born whites and different Latino immigrant generations. In doing so, I aim to document the extent to which these relationships are cumulative (i.e., non-recursive) and differ by ethnicity and immigrant generation. In the preliminary structural models below, I document these processes from early childhood through young adulthood for a national sample of native-born whites and different Latino immigrant generations.

Second, education is a key determinant of other socioeconomic outcomes (like income) as well as health. Education is therefore of central importance for understanding health differentials and paradoxes. Yet, education is a complex bundle of skills, social statuses, and attitudes, beliefs and behaviors (Becker 1975, Sorokin 1937, Bourdieu and Passeron 1977). Previous research documents how status and other non-economic aspects of socioeconomic characteristics are important for health (Marmot et al. 1991, McEwan and Seeman 1999). As a result, the correct measures of socioeconomic status, including education, are not always clear (Lutfey and Freese 2005). This especially true in the case of Latino immigrants. Latino immigrants typically have middling levels of education for their origin country but lower levels of education in the U.S. Thus, immigration effectively alters individuals' social status by changing the average levels of education and income in the society in which they live. Some scholars have argued that this change in relative position has important implications for education outcomes (Feliciano and Luzano 2017); it is unclear whether the same can be said for health outcomes though previous research suggests this is the case generally (Eibner & Evans 2003). Given these basic premises, I measure various educational attainments in the preliminary analysis below—from parents' completed educational attainments in the individual's childhood to the individual own completed education in young adulthood. I also consider multiple,

intermediate measures of the individual child's academic achievement in adolescence. Additionally, I will evaluate the role of status dimensions in the evolution of Latino education-health gradients using measures of a father's and of a mother's quartile of completed education relative to his and her origin country (McLanahan 2004).

Finally, it may well be that different dimensions of education matter for the evolution of education-health gradients. It may also be that some or even perhaps all of the relationships between education and health are explained by selection on unobservables. Only a small portion of the research on education-health gradients considers such unobservables. For example, a parent's relative educational status may be quite important for determining her own health or the health of her child. This is likely given previous research demonstrating the importance of parent socioeconomic status for children's health outcomes even into adulthood (Haas 2006; see also the preliminary analysis below) and the particular importance of Latino immigrant parents' relative educational status in the intergenerational transmission of education (Feliciano and Luzano 2017). But, it may also proxy for a parent's unobserved characteristics, such as determination or conscientiousness. In the preliminary analysis below, I begin to unpack the extent to which typically unobserved parent characteristics, such as smoking behaviors, impact the evolution of education-health gradients through a child's young adult life. In planned extensions to the analysis below, I will consider other observed parent characteristics that might help explain the role of parent education in the evolution of education-health gradients among young adult children, including parent income, early relationship quality with a child, and more. Additionally, I will estimate models with sibling fixed-effects to account for shared, unobserved parent, neighborhood, and other factors that may influence the evolution of education-health gradients.

DATA AND METHODS (PRELIMINARY)

Data

In this analysis, I use a sample of Latino and white young adults from The National Longitudinal Study of Adolescent Health (Add Health). The Add Health is a four-panel study of youths' education, health, romantic, and fertility outcomes and behaviors. The survey is based on a national probability sample of high schools and their feeder middle schools. Select students attending grades 7-12 in those schools, their parents, and school administrators were first interviewed in 1994; students were subsequently re-interviewed in 1996, 2001, and 2007. Students were approximately ages 24-32 at the fourth and most recent wave of the study. The four-panel study sample consists of approximately 15,700 students. The Add Health is particularly appropriate for the study of minority race-ethnic groups such as Latinos given oversamples of many of these populations in the survey. The Add Health oversample design provides a sufficient number of panels of data to study the life course processes driving education-health gradients for an important segment of immigrant youth in this country—immigrant youth who arrived in the U.S. at a relatively early age and has since remained in the U.S.[2] The survey also includes about 2500 sibling pairs.[3] After imputing missing values, I drop observations with missing information on adolescent race-ethnicity, student and main respondent parent immigrant statuses, and young adult depressive symptoms, body mass index, and nicotine dependence symptoms. I further limit my analytic sample to native-born whites and to Latinos, leaving me with 6411 whites, 866 native-born or third immigrant generation Latinos, 772 2.0

[2] Average duration in the U.S. for foreign-born Latinos in my sample is about 7.5 years, meaning that youth in my sample arrived in the U.S. between ages 5 and 11 years.

[3] I include siblings in my preliminary analysis though I do not account for this dependence in standard errors. Supplementary analyses using reduced-form models that account for complex survey design and clustering of sibling observations within a household suggest the results presented here are robust. I will adjust for complex survey design and potentially using household fixed-effects in revisions to this paper for the 2019 PAA Annual Meeting.

generation Latinos, and 514 1.5 generation or foreign-born Latinos. I use Monte Carlo Markov Chain methods to impute missing information on other observables and drop observations following imputation by ethnic group.

I consider three periods in estimated multivariate models: childhood, adolescence, and young adulthood. Childhood measures in the first period are based on surveys in the first and second waves of the study and include basic demographic and socioeconomic background information: gender, age in months at the first interview, whether the youth was born between 1979-1983, census region West, Midwest, or Northeast, whether there was a resident mother figure in the adolescent youth's household in grades 9, 10, or 11, and whether there was a resident father figure in the adolescent youth's household in grades 9, 10, or 11.[4] I enter separate terms describing mother's years of completed education and father's years of completed education when the youth was in grades 9, 10, or 11. These terms are set to zero if no mother or father figure was present in the home when the students was in grades 9, 10, or 11.

In some models, I consider a parent's report of whether the adolescent's mother figure ever regularly smoked or not. This measure proxies the mother's smoking history, and I assume it provides information about the mother's general orientation to health maintenance behaviors. This measure is meant to capture health maintenance behaviors consistently transmitted to the next generation in previous research and *is highly correlated with education but theoretically does not vary according the education or other SES distribution in an immigrant parent's origin country*. Controlling for a mother's smoking history therefore provides an important preliminary test as to the potential importance of a mother's relative education status.

[4] I do not include terms describing ethnicity and immigrant status of youth or their parents since I estimate models separately for these groups. See my description of estimated models below.

Adolescence is the next life course period in the model. In this period, I consider measures of educational attainments and health outcomes and behaviors. To measure adolescent educational attainments, I model students' self-reported grade point average for core subjects as well as a standardized test achievement score.[5] Grade point average is measured on a standard four-point scale. Standardized test achievement is measured using an abridged version of the Peabody Picture Vocabulary Test; I convert raw age-standardized scores to sample percentile rank scores. I consider three measures of adolescent health outcomes and behaviors, outcomes and behaviors with clear analogs in the portion of the model describing young adulthood. First, I use a continuous measure of The Center for Epidemiologic Studies Depression (CESD) scale when adolescents were in grades 9, 10, or 11. This scale measures depressive symptoms defined by the American Psychiatric Association Diagnostic and Statistical Manual. I limit the scale to a subset of four CESD items validated across race-ethnic groups in the Add Health study (Perreira et al. 2005). These items include questions about whether the respondent felt blue, depressed, happy, or sad during the past week. Adolescents were to select one of four response options for each item ranging from 0 ("never or rarely") to 3 ("most of the time or all of the time"), and then responses for all four items are summed. I reverse code the "happy" item before including it in the index summation. The body mass index (BMI) is based on adolescent self-reports of their height and weight when they were in grades 9, 10, or 11. According to the Center for Disease Control, BMI is a reliable indicator of body fatness for most individuals. However, BMI varies considerably by age and sex among young children and adolescents. To account for such group differences in BMI, I regress the BMI on interview age in months at the time of the report and on gender and then take the adjusted adolescent BMI as my measure. I divide this BMI measure by

[5] High school transcript data are available as part of the Add Health study. I use self-reported grade point average in the initial version of this paper given evidence elsewhere that it is just as reliable as a measure of grade point average based on transcript data (e.g., Xie and Greenman 2010).

ten to make its scale more similar to that of depressive symptoms or other health measures. The final measure of adolescent health is whether or not the adolescent youth regularly smoked in the last 30 days.

The final period I consider in the model is young adulthood. Following my specification in the adolescence period, I consider the young adult's educational and health outcomes. I measure educational attainment in young adulthood by years of completed school when students are 24 to 32 years of age.[6] I consider three measures of young adult health: depressive symptoms, BMI, and nicotine dependence. Young adult measures of depressive symptoms and BMI are constructed the same as analogous measures in adolescence so require no further explanation. Nicotine dependence is measured using the Fagerstrom nicotine dependence scale, a validated scale designed to distinguish addicted smokers. Items included in the scale ask young adults who have smoked regularly in the past 30 days questions about whether they smoke first thing in the morning after waking, if they smoke in forbidden places, times of the day they smoke most heavily, how many cigarettes they smoke a day, and more. A higher score indicates greater nicotine dependence. Sample means and standard deviations for all preliminary model variables are shown in Table 1.

Model Specification

I estimate a multivariate model that spans the three periods of interest: childhood, adolescence, and young adulthood. I model educational attainments and health in adolescence and young adulthood as a function of parent/adolescent education and/or health in the prior

[6] This measure is potentially endogenous to young adult health measures taken in the same wave of the study. In supplementary analyses, I limited models to older youth who would have completed their educational attainments well before young adult health measures were taken. I also considered a measure of completed education from the third wave of the study for older youths. Results are generally the same as those presented here.

period. As such, the model makes clear the extent to which education-health gradients differ across the early life course for a sample of Latino and white young adults. I draw comparisons with native-born whites when necessary but mainly focus on differences across immigrant generations in my sample of Latino young adults.

There are a number of ways by which to model education-health relationships across the life course. Most extant research considers a reduced-form model wherein education or health at time *t*-1 determines education or health at time *t*. Variations on this reduced-form approach sometimes consider earlier measures of education or health at time *t*-2 or some other earlier period(s) (Baum and Ruhm 2007). This approach is useful for *beginning* to describe complex developmental processes linking education and health but inherently makes strict assumptions about the structure of these relationships that ultimately obscure the developmental processes of interest. Structural models make these relationships explicit and allow for statistical tests that help distinguish between competing hypotheses about how such complex processes work and critical periods in the life course production of health inequalities.

I begin with the simple life course model where education and health in the immediately previous period determine education and health in the subsequent period. There are no lagged effects greater than *t*-1 in this specification. This model is non-cumulative because the influence of prior measures is exhausted in the following period based on a simple Markov process. I represent this model schematically in Figure 1 with solid lines. I estimated a series of related models that gradually relax the non-accumulation assumption. I estimated these models for whites and for Latinos by immigrant generation and evaluate their fit using the Bayesian Information Criterion (BIC).[7] The BIC statistics for these models are shown in Table 2. In the

[7] See Raftery (1995) for a detailed discussion of the BIC statistic.

present analysis, a more negative BIC by an increment of ten or more indicates a better fitting model.

Insert Figure 1. Here. Schematic Model of Education and Health Production among Latino Youth.

The revised simple life course model of education-health gradients for Latinos can be defined with the following notation: The matrix $\mathbf{x}^{k}_{t=1}$ is a K by 1 vector of exogenous childhood characteristics at $t = 1$; the matrix $\mathbf{y}^{j}_{t}$ is a J by 1 vector of observed endogenous variables representing youths' educational attainments and health outcomes and behaviors in adolescence and young adulthood at $t = 2$ and 3. Periods $t = 2$ and 3 correspond to adolescence and young adulthood, respectively. In the structural model, $\boldsymbol{\beta}^{j}_{t}$ is a J by J matrix describing the relationships among these endogenous variables, and $\boldsymbol{\Gamma}^{jk}_{t}$ is a J by K matrix describing the relationships between exogenous childhood characteristics and youths' educational attainments and health outcomes and behaviors. The matrixes $\boldsymbol{\Phi}_{t=1}$ and $\boldsymbol{\Psi}_{t}$ are period-specific variance-covariance matrices for $\boldsymbol{\xi}^{k}_{t=1}$ and $\boldsymbol{\eta}^{j}_{t}$. The structural model for adolescent educational attainments and health outcomes and behaviors at period $t = 2$ is given by:

$$y^{j}_{t=2} = \Sigma\boldsymbol{\gamma}^{jk}_{t=1}\mathbf{x}^{k}_{t=1} + \zeta^{j}_{t=2}, \qquad (1)$$

where j is limited to the youths' grade point average, test achievement, CESD depressive symptoms, BMI, and regularly smoking in the past 30 days at $t = 2$. The ζ^j_t are random disturbance terms and covary among elements of $\mathbf{y^j_2}$. By estimating these off-diagonal elements of $\mathbf{\Psi_t}$ or cross-equation covariances among the ζ^j_t at $t = 2$, I account for reciprocal relationships between endogenous measures of adolescent educational attainments and health outcomes and behavior I cannot otherwise identify. I also allow the random disturbance terms for exogenous variables in $\mathbf{x^k_{t=1}}$ to vary with one another. That is, I estimate the diagonal and sub-diagonal elements of the matrix $\mathbf{\Phi_{t=1}}$. The exact structure of these variance-covariance matrixes are not shown in Figure 1. The structural model for young adult education at $t = 3$ is given by:

$$y^j_t = \Sigma\boldsymbol{\gamma}^{jk}_{t=1}\mathbf{x}^k_{t=1} + \Sigma\boldsymbol{\beta}^j_{t-1}\boldsymbol{\eta}^j_{t-1} + \zeta^j, \qquad (2)$$

where the y^j_t refers to years of completed schooling by 2007 when youths were about 24 to 32 years of age. Young adult educational attainment is a function of both exogenous childhood characteristics in $\mathbf{x}^k_{t=1}$ as well as endogenous measures of adolescent education and health outcomes and behaviors in $\boldsymbol{\eta}^j_{t-1}$. Unlike young adult education, health in the same period is only a function of the *same* health measure in the prior period and of young adult education. This is given by the equation:

$$\mathbf{y}^j_t = \beta^j_t\eta^j_t + \Sigma\boldsymbol{\beta}^j_{t-1}\boldsymbol{\eta}^j_{t-1} + \zeta^j, \qquad (3)$$

where the $\mathbf{y}^j_t$ refer to young adult CESD depressive symptoms, BMI, and nicotine dependence. The term η^j_t refers to the relationship between young adult education and each analogous

measure of young adult health. Given that youths were about 24 to 32 years of age at the time the measure of young adult education was taken, I assume this measure determines young adult health. Supplementary analyses described in footnote six suggest this is a reasonable assumption to make. Moreover, Latinos generally attain less education overall compared to most other race-ethnic (Snyder et al. 2009), suggesting that a measure of education taken at age 24 or older is not endogenous to a measure of young adult health taken at the same time.[8] Note that young adult health is not determined by childhood characteristics or adolescent educational attainments in this specification. Also, I model health as a function of only the same measure of health in the prior period.

FINDINGS (PRELIMINARY)

The (Non)Accumulation of Education-Health Advantages in the Life Course: Whites and Latinos

I begin by comparing the basic structure of life course education-health gradients for Latino and white youths in my sample. Model fit statistics for a series of life course models of education-health gradients are shown in Table 2. I begin with the simple structural model depicted by solid lines in Figure 1 and partially defined above. A simple, *non*-cumulative model in which youth education and health depend on (parent or youth) education in the immediately prior period fits the data relatively well for all Latino immigrant generations. The model fit is rather poor for native-born whites, however, so I sequentially relax constraints from observed

[8] This argument is less sound for stock measures of health such as body mass index. However, I follow the bulk of previous research on education-health gradients and assume young adult education is exogenous to this measure, especially since, unlike research elsewhere, I have considered BMI and education in the prior, adolescent period and allowed disturbances on those terms to covary.

parent and youth characteristics in previous periods to youth education and health in subsequent periods based on Lagrange multiplier test values indicating improvements in model fit for relaxing specific model constraints and improvements in the BIC statistic (Kaplan 2000). Looking down the column of fit statistics for native-born whites in Table 2, it is clear that model fit vastly improves as more linkages between prior educational statuses and subsequent health outcomes and behaviors are added. Model fit for native-born whites improves most once I model young adult's years of completed education as a function of parents' years of completed education. Model fit also notably improves for this group once I model young adult BMI as a function of parent's years of completed education and adolescent smoking and young adult health measures as functions of adolescent grade point average.

Models that consider these same relationships among Latino youth do not improve upon the fit of simpler models for Latino youth. ***This suggests that there are more cumulative relationships between education and health for native-born white young adults than their Latino counterparts.***

For example, parents' years of completed education directly determines adolescent health and academic achievement as well as young adult education. Thus, parent education determines young adult health through each of these three channels in addition to its direct effects on young adult BMI. In comparison, parent education determines Latinos' young adult health only through its relationships with adolescent health and young adult education. There are no direct relationships for this group between adolescent grade point average or select young adult health measures and parent education that we observe for whites. ***Thus, the young adult education-young adult health gradient is most important for Latino young adults.*** Their parents' level of education and their adolescent academic achievement only have indirect influence on their own

health in young adulthood. ***So, the life course relationships between education and health for Latino youth are shallow and do not reinforce themselves to the extent that these linkages do among native-born whites.***

Increasing Cumulative Advantage in Education across Latino Immigrant Generations

Next, I estimate a variety of models that consider equality constraints across education-health relationships in the preferred life course model from Table 2 for Latino young adults, Model 2. Comparing model fit across models with equality constraints for specific parameter estimates across Latino immigrant generations, I can better pinpoint which relationships likely drive observed differences in Table 1 between whites and Latinos. Fits statistics for these new models are shown in Table 3.

I begin by estimating models with equality constraints across key model parameters for 1.5 and 2.0 immigrant generation Latinos in Panel A of Table 3. I first present the overall BIC statistic for the preferred model from Table 2 for all three immigrant generation groups (M1, Table 3). Then, I introduce alternative equality constraints for 1.5 and 2.0 generation immigrants. Foreign-born Latino youth and native-born Latino youth with immigrant parents are generally similar not only in the structure of processes driving the evolution of education-health gradients through young adulthood but in the magnitude of these relationships as well. Exceptions to the general similarity between 1.5 and 2.0 generation Latinos include the relationship between parent education and young adult education (Model 4), adolescent education and young adult education (Model 5), and adolescent health and young adult health (Model 7). These differences complement evidence of white-Latino differences in the structure of a life course model of

education-health gradients: ***These differences suggest that the life course connections between education in particular tighten and begin to accumulate the longer Latino youth and their parents reside in the U.S.*** The changes in the BIC statistic for these models do not constitute very strong evidence of equality across these groups—but almost. And, a model constraining all education-health relationships in the model between 1.5 and 2.0 generation Latinos fits the data much better (Model 10, Table 3 versus Model 1).

The Alternate Importance of Mother's Education across Latino Immigrant Generations

Given equality in parameter estimates between Latino immigrant generations 1.5 and 2.0, I now consider the evidence of differences in the magnitude of education-health relationships between 1.5/2.0 and 3.0 generation Latino young adults in Panel B, Table 3.

I freely estimate education-health relationships for which the evidence of equality across groups is less clear to examine potential generational differences in the magnitude of these relationships obscured by gross tests of model fit. These model coefficients are presented in Table 4. I present pooled estimates unless individual estimates by immigrant generation are included in the table. For example, I present a single pooled estimate of the relationship between mother's years of completed education and adolescent GPA but present separate estimates by immigrant generation for the relationship between mother's years of completed education and young adult's years of completed education. Coefficients significant at the .05-level or lower are indicated by an asterisk symbol.

A closer inspection of model coefficients across immigrant generations in Table 4 confirms the general conclusion that generational differences in education-health relationships are minimal among Latino youth. ***The single exception to this pattern is the effect of mother's***

education on young adult education. In that case, the coefficient for mother's education is* in*significant in the 1.5/2.0 generations but is significant and similar in size to the relationship between father's education and young adult's education in the 3.0 generation. Thus, mothers who are themselves educated in the U.S. are able to directly influence the level of schooling their young adult children will complete, which in turn directly determines their young adult child's health—particularly BMI and nicotine dependence in this sample of young adults. This is not the case for Latino immigrant mothers.

To begin to unpack why Latino immigrant mothers' education may not matter for a child's own education and thus health, I consider whether other characteristics of an immigrant mother that would correlate with her own health as well as her child's health might still impact a child's health and education outcomes. Table 5 presents fit statistics for a pooled model of life course education-health relationships among Latinos that include a parent report of whether the resident mother figure has ever regularly smoked or not. The introduction of this measure of mother's health orientation and behavior dramatically improves model fit (Model 1 versus Model 2, Table 5). ***Subsequent models introduce equality constraints across immigrant generation groups and demonstrate that, a mother's smoking history is important for understanding the development of education-health gradients. Moreover, its effects do* not *vary across immigrant generation. This pattern suggests that measures of maternal education for parents not educated in the U.S. might mask important health maintenance behaviors and orientations transmitted from one generation to the next, regardless of immigrant status.*** Nonetheless, this is an interesting but imperfect test. In planned future analyses, I will consider direct measures of parents' relative educational status by considering a parent's education quartile on the educational distribution of her or his origin country. I will also consider a wider array of parent

behaviors and characteristics in a child's earlier life course as well as unobserved parent and other factors shared by siblings that may drive differences in the role of maternal education across Latino immigrant generations observed here.

DISCUSSION AND CONCLUSION

In this preliminary analysis, I revisited attenuated education-health gradients among Latinos using a cumulative advantage framework. Previous research documents attenuated relationships between education and health among Latinos, particularly immigrants. Thus, research on the development of education-health gradients across Latino immigrant groups and in comparison to whites can shed light on the critical periods of the life course in which this gradient is strongest and the processes by which it emerges.

To determine life course processes driving education-health gradients and critical periods in their development for Latino youths, I estimate separate multi-equation structural models for different immigrant generations of Latinos as well as native-born whites. I use these models to draw comparisons across these groups and to test for similarities in the emergent life course processes driving education-health gradients and paradoxes in them. This approach builds on research elsewhere on cumulative advantage in health (e.g., Ferraro and Kelly-Moore 2003) and on social causation and health selection in the life course and on the importance of childhood health for later socioeconomic attainments in adulthood (e.g., Warren 2007, Haas 2006).

Model estimates demonstrate three key findings. First, the processes by which education-health gradients develop in the life course differ significantly between white and Latino young adults. For Latinos, this process has relatively few reinforcing or cumulative relationships across the life course. The effects of education and health in one period are largely exhausted through

their relationships with education and health in the next immediate period. Thus, young adult education is critical for Latinos' young adult health outcomes while parent education is not. This is in stark contrast to whites. In that case, model results demonstrate more reinforcing connections between educational attainments across the life course and young adult health, including parents' years of completed education, adolescent grade point average, and years of completed education in young adulthood. It is possible that I am simply unable to detect more nuanced relationships in the model of Latinos' life course health gradients given the smaller sample size. However, pooled estimates and fit statistics across sizeable groups of Latino immigrant generations do not support the notion that a larger sample size would alter the observed white-Latino differences in the development of education-health gradients. These patterns hold across robustness checks including models that consider family income, older and younger samples of young adult children, and discrete measures of education and health outcomes.

Second, I find relatively few differences in the magnitude of education-health relationships across different immigrant generations of Latinos. The exception to this pattern is the relationship between mother's years of education and young adult education. In that instance, a mother's education does not determine young adult Latinos education unless mothers are native born and have been educated in the U.S. themselves. This is in addition to few to no statistically significant relationships between mother's education and other adolescent and young adult outcomes.

This second main finding invites the question: How is it that Latino immigrant mothers' education seemingly matters so little for their young adult children's health, especially given evidence of the often greater importance of mothers' education for children's outcomes (Currie

et al. 2007, Beller 2009)? I find that an indicator of mother's smoking history is a strong and significant predictor of children's adolescent education *and* young adult health. This underscores the possibility that while Latino immigrant mothers may be less likely to transmit (dis)advantage to their children via their educational attainments, they still influence their children's health through their health behaviors and orientations and that this influence generally does not vary across Latino immigrant generations. This suggests that, superficially, there is a Latino paradox in the evolution of education-health gradients across whites and different Latino immigrant generations. However, this paradox masks other, important health dynamics in the life course that vary by SES and become of primary importance when the influence of parents' formal educational attainments is depressed via social and cultural institutions. It appears that (dis)advantages accumulate across the life course via informal mechanisms of health production not necessarily captured by traditional measures of completed education. It may also be the case that mothers' unobserved characteristics may be driving model estimates, however.

In planned analyses for the Population Association of America's annual meeting, I will refine the models presented here to include a wider variety of observed parent characteristics, including income, additional health behaviors, and relationship quality with a given child. Additionally, I will expand measures of parent education to include measures of each parent's education quartile in her and his origin country. Finally, I will extend my preliminary structural models to include sibling fixed effects that account for unobserved factors shared by siblings.

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Table 1. Sample Means and Standard Deviations by Ethnicity and Immigrant Generation

Childhood	**Native White**	**Native Latino**	**1.5 Latino**	**2.0 Latino**
Female	0.522	0.490	0.543	0.572
	(0.008)	(0.025)	(0.033)	(0.026)
Age in Months	194.512	196.12	201.00	198.09
	(0.225)	(0.735)	(0.981)	(0.717)
Born 1979-1983	0.629	0.595	0.462	0.545
	(0.008)	(0.025)	(0.033)	(0.026)
West	0.144	0.475	0.265	0.412
	(0.006)	(0.025)	(0.030)	(0.025)
Midwest	0.372	0.131	0.018	0.045
	(0.008)	(0.017)	(0.009)	(0.011)
South	0.315	0.236	0.641	0.441
	(0.008)	(0.021)	(0.032)	(0.026)
Northeast	0.169	0.158	0.076	0.102
	(0.006)	(0.018)	(0.018)	(0.016)
Mother's Years of Ed	13.586	12.546	11.331	10.763
	(0.038)	(0.118)	(0.233)	(0.141)
Father's Years of Ed	13.622	12.553	10.998	11.092
	(0.042)	(0.140)	(0.206)	(0.149)
Mother Evr Smkd	0.508	0.485	0.359	0.316
	(0.008)	(0.025)	(0.032)	(0.024)
Adolescence				
GPA	2.694	2.326	2.400	2.281
	(0.014)	(0.044)	(0.054)	(0.044)
Test Achievement	105.95	97.97	88.27	96.78
	(0.191)	(0.699)	(1.231)	(0.778)
CESD Depressive Symptoms	2.029	2.463	2.281	2.802
	(0.034)	(0.122)	(0.137)	(0.112)
BMI	22.598	23.846	22.428	22.930
	(4.335)	(4.619)	(4.007)	(4.225)
Regular Smoking,	0.195	0.163	0.067	0.115
Past 30 Days	(0.396)	(0.019)	(0.017)	(0.017)
Young Adulthood				
Years of Education	14.623	13.794	14.036	13.984
	(0.039)	(0.105)	(0.156)	(0.112)
BMI	27.869	29.985	27.956	29.557
	(0.109)	(0.336)	(0.401)	(0.364)
CESD Depressive Symptoms	1.826	1.992	1.955	2.059
	(0.033)	(0.103)	(0.148)	(0.107)
Nicotine Dependence	1.717	1.164	0.418	0.539
	(0.041)	(0.109)	(0.092)	(0.077)
Number of Observations	6411	866	514	772

Table 2. Bayesian Information Criterion Statistics for Structural Education-Health Models by Ethnicity and Immigrant Generation

	Simple Education-Health Model by Ethnicity and Immigrant Generation	Native Whites	Native Latinos	1.5 Latinos	2.0 Latinos
1	Life Course Recursive Model of Education and Health	1332	-145	-182	-157
2	M1 + Parent Education to Young Adult Education	299	-200	-205	-198
3	M2 + Parent Education to Young Adult BMI	191	-198	-194	-186
4	M3 + Adolescent Smoking on Young Adult BMI	92	-202	-190	-182
5	M4 + Adolescent GPA on Young Adult Health	58	-195	-175	-164

Note: The more negative the BIC statistic, the better the model fit to the data. A change of 10 or more constitutes strong evidence of a better (worse) fitting model.
resident mother or father figure.

Table 3. Bayesian Information Criterion Statistics for Structural Education-Health Models by Ethnicity and Immigrant Generation

Panel A: Simple Structural Model w/Equality Constraints to 1.5 and 2.0 Latino Immigrant Generations		
1	Preferred Simple Structural Model (Model 2, Table 2), Freely Estimated Across Latino Immigrant Group	-770
2	M1 + Equal Parent Education to Adolescent Health for 1.5 and 2.0 Generations	-801
3	M1 + Equal Parent Education to Adolescent Education for 1.5 and 2.0 Generations	-781
4	M1 + Equal Parent Education to Young Adult Education for 1.5 and 2.0 Generations	-778
5	M1 + Equal Adolescent Education to Young Adult Education for 1.5 and 2.0 Generations	-777
6	M1 + Equal Adolescent Health to Young Adult Education for 1.5 and 2.0 Generations	-785
7	M1 + Equal Adolescent Health to Young Adult Health for 1.5 and 2.0 Generations	-779
8	M1 + Equal Young Adult Education to Young Adult Health for 1.5 and 2.0 Generations	-780
9	M1 + Equal Correlation Btwn Adolescent Education to Adolescent Health for 1.5 and 2.0 Generations	-800
10	M1 + Constraints 2-9	-893
Panel B: Simple Structural Model w/ Equality Constraints for Latino Native-Born and Immigrant 2.0 Generations		
11	M10 + Equal Parent Education to Young Adult Education for Native and 2.0 Generations	-900
12	M10 + Equal Adolescent Education to Young Adult Education for Native and 2.0 Generations	-907
13	M10 + Equal Adolescent Health to Young Adult Health for Native and 2.0 Generations	-903
14	M10 + Constraints 11-13	-918
Panel C: Simple Structural Model w/ Equality Constraints for All Generations		
15	M14 + Equal Parent Education to Adolescent Health for All Generations	-937
16	M14 + Equal Parent Education to Adolescent Education for All Generations	-939
17	M14 + Equal Adolescent Health to Young Adult Education for All Generations	-940
18	M14 + Equal Young Adult Education to Young Adult Health for All Generations	-938
19	M14 + Equal Correlation between Adolescent Education and Adolescent Health for All Generations	-949
20	M14 + Constraints 15-19	-1052

Table 4. Preferred Model of Life Course Education-Health Gradients by Latino Immigrant Generation, Pooled

	M Ed	Fa Ed	GPA	Test	BMI	CESD	Smk	YA Ed
Adolescence								
GPA	0.01	0.037*						
	(.008)	(.007)						
Test	0.008*	0.009*						
	(.001)	(.001)						
BMI	0.02	-0.02						
	(.012)	(.011)						
CESD	-0.01	-0.091*						
	(.021)	(.019)						
Smoking	0.00	0.00						
	(.003)	(.003)						
Young Adulthood								
Education								
1.5	0.01	0.136*	0.555*	1.804*	-0.11*	-0.02	-0.277*	
	(.026)	(.027)	(.082)	(.372)	(.028)	(.015)	(.106)	
2.0	0.01	0.112*	0.646*	2.135*	-0.11*	-0.02	-0.277*	
	(.024)	(.022)	(.047)	(.278)	(.028)	(.015)	(.106)	
Native	0.11*	0.077*	0.646*	2.135*	-0.11*	-0.02	-0.277*	
	(.027)	(.023)	(.047)	(.278)	(.028)	(.015)	(.106)	
BMI								
1.5					0.244*			-0.029*
					(.021)			(.007)
2.0					0.257*			-0.029*
					(.012)			(.007)
Native					0.257*			-0.029*
					(.012)			(.007)
CESD								
1.5						0.327*		-0.16
						(.039)		(.024)
2.0						0.209*		-0.16
						(.021)		(.024)
Native						0.209*		-0.16
						(.021)		(.024)
Nicotine Dependence								
1.5							0.873**	-0.145***
							(.254)	(.020)
2.0							0.931***	-0.145***
							(.124)	(.020)
Native							0.931***	-0.145***
							(.124)	(.020)

Note: * $p<0.05$

Table 5. Bayesian Information Criterion Statistics for Structural Education-Health Models with Mother's Smoking History by Immigrant Generation

		BIC
1	Preferred Pooled Latino Generation Model (M20, Table 3)	-1052
2	M1 + Mother Ever Smoked to Adolescent Education and Young Adult Health	-1160
3	M2 + Equality Constraints Across Generations in Mother Ever Smoked to YA BMI	-1175
4	M2 + Equality Constraints Across Generations in Mother Ever Smoked to YA CESD	-1167
5	M2 + Equality Constraints Across Generations in Mother Ever Smoked to YA Nicotine	-1172
6	M2 + Equality Constraints Across Generations in Mother Ever Smoked to Adolescent Education	-1174

Table 6. Pooled Model of Life Course Education-Health Gradients with Mother's Smoking History Among Latinos by Immigrant Generation

	M Smk			M Ed			F Ed			YA Ed	
	1.50	2.00	Native	1.50	2.00	Native	1.50	2.00	Native	1.5	2.0/Native
Adolescent											
GPA	-0.13	-0.10	-0.188*	0.01	0.005	0.005	0.037*	0.037*	0.037		
	(.077)	(.064)	(.057)	(.008)	(.008)	(.008)	(.007)	(.007)	(.007)		
Test				0.008*	0.008	0.008	0.009*	0.009*	0.009		
				(.001)	(.008)	(.001)	(.001)	(.001)	(.001)		
BMI				0.02	0.02	0.02	-0.02	-0.02	-0.02		
				(.012)	(.012)	(.012)	(.011)	(.011)	(.011)		
CESD				-0.01	-0.008	-0.008	-0.091*	-0.091*	-0.091*		
				(.021)	(.021)	(.021)	(.019)	(.019)	(.019)		
Smoking				0.00	-0.001	-0.001	0.00	0.00	0.00		
				(.003)	(.003)	(.003)	(.003)	(.003)	(.003)		
Y Adult											
Education											
				0.01	0.01	0.11	0.136*	0.112*	0.077*		
				(.026)	(.024)	(.027)	(.027)	(.022)	(.023)		
BMI	0.107*	0.093*	0.096*							-0.027*	-0.027*
	(.054)	(.045)	(.041)							(.007)	(.007)
CESD	-0.04	0.28	0.401*							-0.151*	-0.151*
	(.194)	(.152)	(.137)							(.024)	(.024)
Nicotine	0.517*	0.23	0.405*							-0.14*	-0.14*
	(.136)	(.120)	(.132)							(.020)	(.020)

Note: * $p<0.05$

Figure 1. Schematic Life Course Model of Education-Health Gradients for Latino Young Adults