

An Empirical Test of Ecodevelopmental Theory in Predicting HIV Risk Behaviors Among Hispanic Youth

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Ecodevelopmental theory is a theoretical framework used to explain the interplay among risk and protective processes associated with HIV risk behaviors among adolescents. Although ecodevelopmentally based interventions have been found to be efficacious in preventing HIV risk behaviors among Hispanic youth, this theory has not yet been directly empirically tested through a basic research study in this population. The purpose of this cross-sectional study was to empirically evaluate an ecodevelopmentally based model using structural equation modeling, with substance use and early sex initiation as the two outcomes of the ecodevelopmental chain of relationships. The sample consisted of 586 Hispanic youth (M age = 13.6; SD = 0.75) and their primary caregivers living in Miami, Florida. Adolescent, parent, and teacher reports were used. The results provided strong support for the theoretical model. More specifically, the parent-adolescent acculturation gap is indirectly related both to early sex initiation and to adolescent substance use through family functioning, academic functioning, perceived peer sexual behavior, and perceived peer substance use. Additionally, parent's U.S. orientation is associated with adolescent substance use and adolescent sex initiation through social support for parents, parental stressors, family functioning, academic functioning, and perceived peer sexual behavior and substance use. These findings suggest that HIV risk behaviors may best be understood as associated with multiple and interrelated ecological determinants.

Keywords: *Hispanics; substance use; HIV; ecodevelopmental theory*

Hispanics are the largest and fastest growing ethnic minority group in the United States. The U.S. Hispanic population increased from 9% of the overall U.S. population

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in 1990 to 15% in 2007 (Bernstein, 2008). Hispanics have accounted for nearly half of all U.S. population growth since 2000 and are expected to comprise 25% of all Americans by 2050 (Bernstein, 2008). Hispanics are also a young population, with nearly 40% under age 20 (Ramirez & de la Cruz, 2003).

Along with their large and rapidly increasing numbers, Hispanic adolescents in the United States are at higher risk for substance use (including alcohol, cigarette, and illicit drug use) than either non-Hispanic White or non-Hispanic Black adolescents (Johnston, O'Malley, Bachman, & Schulenberg, 2008). Furthermore, Hispanic adolescents report engaging in sexual intercourse earlier than do non-Hispanic Whites (although not earlier than non-Hispanic Blacks), and they have the lowest condom use rates of any U.S. ethnic group (Centers for Disease Control and Prevention, 2006). Preventing substance use and delaying the onset of sexual activity is important given that both substance use and early sexual activity are associated with HIV infection (Prado et al., 2006). In summary, although the national statistics are alarming for all youth, what may be even more disconcerting is that Hispanic youth, the largest and fastest growing demographic group in the United States (Ramirez & de la Cruz, 2003), appear to be at heightened risk for early engagement in severely health compromising behaviors. Preventing these HIV risk behaviors in this population is, therefore, an urgent public health issue.

To prevent both substance use and early sexual behavior initiation among Hispanic youth, it is important to understand the social-contextual processes associated with these behaviors. Therefore, the purpose of this cross-sectional study was to empirically evaluate an ecodevelopmental based model with substance use and early sex initiation as the two outcomes of the ecological/ecodevelopmental chain of relationships. This study contributes to the literature by examining the indirect effects among these processes as well as by evaluating the direct effects in a single comprehensive model. Although many of these direct effects have been examined in prior research, this study is one of the first to examine them within a comprehensive model in which indirect effects can also be investigated. These findings may then be used as a springboard for future longitudinal studies further ascertaining the contextual predictors of substance use and sexual risk taking in Hispanic adolescents.

ECODEVELOPMENTAL THEORY: ECOLOGICAL PREDICTORS OF HIV RISK BEHAVIOR

Adolescent health risk behaviors, including substance use and early sex initiation, are influenced by a number of risk and protective processes. Risk and protective processes that have been identified as correlates of adolescent problem behaviors include (but are not limited to) positive parent-adolescent communication; poor bonding to family; academic failure; lack of commitment to school; and peer rejection (Lopez et al., in press; Prado et al., 2009). Research has documented that difficulties in several different domains of functioning interact to increase the likelihood of substance use and early sex initiation (Dishion, Nelson, & Bullock, 2004; Hawkins, Catalano, & Miller, 1992). Studying risk and protective processes independently provides an incomplete picture and carries the danger of overestimating the effects of a single risk and protective process when examined in isolation from other simultaneously operating risk and protective processes (Magnusson & Casaer, 1993; Thornberry, 1994). Rather, individual risk and protective processes work together, often influencing one another—and some risk and protective processes affect the target behavior indirectly through

other risk processes (Prado et al., 2009; Szapocznik & Coatsworth, 1999). Such mediational sequences can be examined only by studying risk and protection as an integrated developmental process (Schwartz, Pantin, Coatsworth, & Szapocznik, 2007). The complexity of the determinants of substance use and early sex initiation requires that these behaviors be understood as multidetermined phenomena, with multiple and interrelated processes contributing to their development (Prado et al., 2009). Ecodevelopmental models (e.g., Pantin, Schwartz, Sullivan, Prado, & Szapocznik, 2004) focus on the multiple social contexts influencing development, the interrelations between those contexts, and how these elements affect risk for the development of drug use and unsafe sexual behaviors in adolescents (Cicchetti & Rogosch, 2002).

In our construction of ecodevelopmental theory (Pantin et al., 2004), we have incorporated three primary, integrated elements. We focus on two of these in this study: (a) social ecological theory and (b) an emphasis on interplay and sequencing among social-contextual processes. The social-ecological component of ecodevelopmental theory is drawn from Bronfenbrenner's work on the social ecology of human development (Bronfenbrenner, 1979, 1986). Bronfenbrenner has organized the multiple influences on adolescent development according to their proximity to the adolescent, presented here from furthest to closest: macrosystems (the broad social and philosophical ideals that define a particular culture, such as culture and acculturation¹), exosystems (contexts in which the adolescent does not participate directly but that impact the functioning of important members of the adolescent's life, such as parents' support systems), mesosystems (contexts comprised of the interactions between important members of the different contexts in which the adolescent participates directly, such as parental monitoring of peers), and microsystems (contexts in which the adolescent participates directly, such as the family).

The social-interactive component of ecodevelopmental theory holds that risk and protection are expressed in the patterns of relationships and direct transactions between individuals and processes within and across levels of context (Pantin et al., 2004). For example, the amount of social support experienced by parents is directly predictive of the harshness or supportiveness in their parenting (Swick & Broadway, 1997), which in turn may affect the likelihood of adolescent drug use and unsafe sexual behavior (Broman, Reckase, & Freedman-Doan, 2006; Roche, Ahmed, & Blum, 2008). Table 1 lists the variables that we are using within each level of context.

Cultural processes, such as the parent's own acculturation and the mismatch between parent and adolescent U.S. and Hispanic orientations (i.e., parent-adolescent acculturation gap) are central to ecodevelopmental theory (Prado et al., 2008). Ecodevelopmental theory holds that cultural processes, such as parents' lack of familiarity with U.S. culture and the resulting parent-adolescent acculturation gap, produce a trickle-down effect by contributing to exosystemic problems such as parental isolation, which in turn may cut parents off from their adolescents' peer networks (i.e., mesosystemic problems). For example, according to some investigators, differential acculturation promotes risk for drug use and HIV risk behaviors in Hispanic immigrant adolescents because it creates additional familial conflict that undermines adolescent bonding to the family and erodes parental authority (Martinez, 2006). For example, parents may perceive their adolescents' "Americanized" behaviors as disrespectful to the family and may try to reassert their authority in hopes of regaining control. In turn, the overly restrictive and controlling parenting style is likely to produce rebellion in the adolescent (Bean, Barber, & Crane, 2006) and to result in deterioration of the family-child relationship.

Table 1. Constructs Included in This Study

Systemic Level or Construct	Brief Definition	Sample Item	Answer Categories
<p>Macrosystem</p> <p>American cultural orientation</p>	<p>Engagement in practices typical of American culture, such as speaking English and eating American foods (Sullivan et al., 2007)</p>	<p>How comfortable do you feel speaking English at home?</p>	<p>1 <i>not at all comfortable</i></p> <p>2</p> <p>3</p> <p>4</p> <p>5 <i>very comfortable</i></p>
<p>Differential Americanism</p>	<p>Parent-adolescent differences in engagement in American cultural practices (Martinez, 2006)</p>		
<p>Exosystem</p> <p>Social support for parents</p>	<p>Availability of friends and other resources to whom parents can turn when they need help or comfort (Cutrona, Cole, Colangelo, Assouline, & Russell, 1994)</p>	<p>There are people I can depend on if I really need it.</p>	<p>1 strongly disagree</p> <p>2 disagree</p> <p>3 agree</p> <p>4 strongly agree</p> <p>0 no</p> <p>1 yes</p>
<p>Parental stress</p>	<p>Economic and immigration-related pressure on parents that distracts them from parenting (Cohen, Kessler, & Gordon, 1997)</p>	<p>My income has not been sufficient to support my family or myself. (Economic stress)</p> <p>I have felt unaccepted by others because of my Latino culture. (Immigration stress)</p>	
<p>Mesosystem</p> <p>Parental monitoring of peers</p>	<p>Parental supervision of adolescents' friends, activities, and whereabouts (Dishion, Poulin, & Skaggs, 2000; Kerr & Stattin, 2000)</p>	<p>How well do you personally know your child's best friends?</p>	<p>1 not at all</p> <p>2 a little bit</p> <p>3 somewhat well</p> <p>4 pretty well</p> <p>5 extremely well</p>
<p>Parental involvement in school</p>	<p>Parental supervision of adolescents' schoolwork and parental communication with teachers (Eccles & Harold, 1993, 1996)</p>	<p>How often do you talk with your child about how he or she is doing in school?</p>	<p>1 hardly ever</p> <p>2 sometimes</p> <p>3 often</p>

(continued)

Table 1. (continued)

Systemic Level or Construct	Brief Definition	Sample Item	Answer Categories
Microsystem Family functioning	Positive parenting and parental involvement with the adolescent; overall family cohesion and communication (Gorman-Smith, Tolan, Zelli, & Huesmann, 1996; Schwartz, Pantin, Prado, Sullivan, & Szapocznik, 2005)	When you have done something that your parents like or approve of, how often does your mother give you a wink or a smile? (Positive parenting) How often do you like to do things together with the family? (Parent involvement) My family knows what I mean when I say something. (Family communication) I can discuss my beliefs with my mother without feeling restrained or embarrassed. (Parent-adolescent communication)	1 almost never 2 sometimes 3 often 1 almost never 2 sometimes 3 often 1 not at all true 2 hardly ever true 3 true a lot 4 almost always or always true 1 strongly disagree 2 moderately disagree 3 neither agree nor disagree 4 moderately agree 5 strongly agree 0 none of them 1 any of the them 0 no 1 yes
Peer risk behavior	Friends' engagement in substance use and sexual behavior (Gorman-Smith et al., 1996; Prinstein & Wang, 2005; Schwartz et al., 2005)	How many of your friends have used marijuana or hashish ("pot," "grass," "hash") in their lifetime? When you and your friends are alone in a private place, do any of the boys and girls have sexual intercourse with one another? School work is messy, sloppy.	1 no problem 2 mild problem 3 severe problem
School functioning	Bonding to school; academic grades; conduct in school (Murray & Greenberg, 2000; Roeser et al., 2008)		

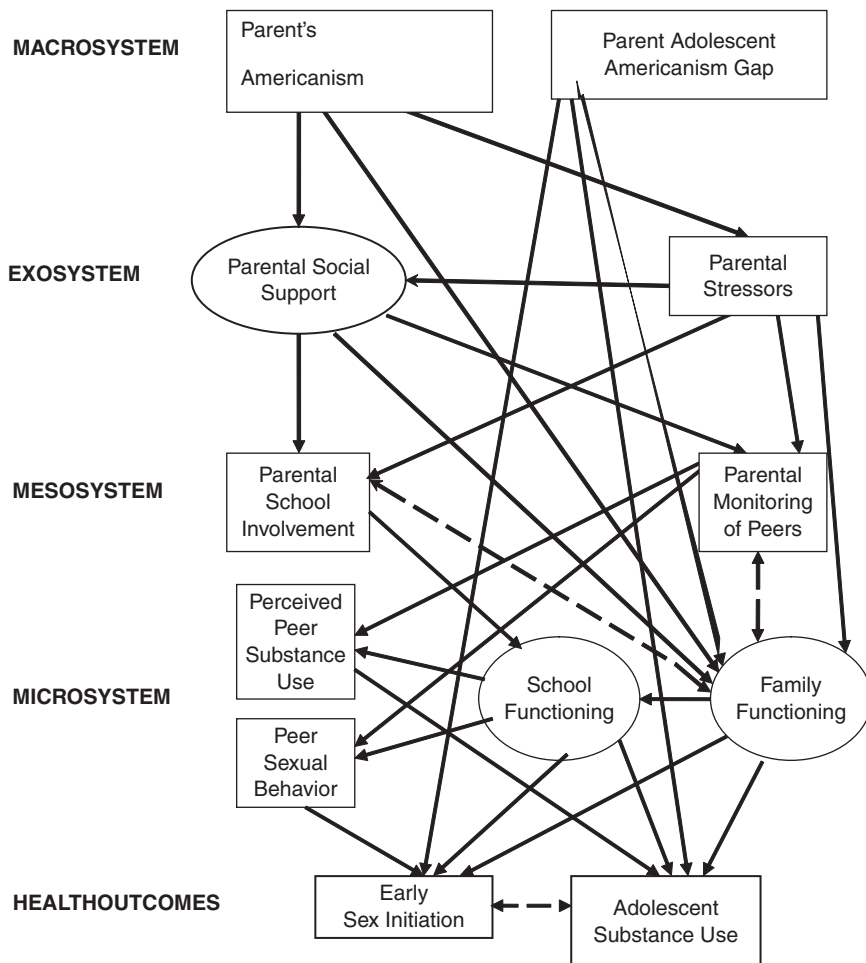


Figure 1. Hypothesized ecodevelopmental model in predicting HIV risk behaviors.

The purpose of this study was to begin to empirically evaluate the trickle-down process of acculturation and parent–adolescent acculturation gap, with substance use and early sex initiation posited as outcomes of this ecological/ecodevelopmental chain of relationships (see Figure 1). Figure 1 displays all of the direct contextual relationships that will be examined as part of the hypothesized model. Support for all of the contextual relationships hypothesized in Figure 1 has been obtained in prior research (Henry, Schoeny, Deptula, & Slavick, 2007; Lopez et al., in press; Martinez, 2006) or has been suggested by clinical literature (Pantin et al., 2004). For example, differences in acculturation between Hispanic parents and adolescents may compromise the parent–adolescent relationship and the family system as a whole (Martinez, 2006). For another example, parents who are close to their adolescents (positive family functioning) may be more likely to monitor them (Dishion, Poulin, & Skaggs, 2000) and to be involved in their schoolwork (Lopez et al., in press).

As part of testing the trickle-down effect within ecodevelopmental theory, we hypothesize three indirect paths in addition to the direct paths presented in Figure 1.

First, we hypothesize that macrosystemic processes (parental acculturation and parent–adolescent acculturation gap) will influence both substance use and early sex initiation through family functioning, school functioning, perceived peer sexual behavior, and perceived peer substance use. Additionally, we hypothesize that parent’s level of acculturation will be indirectly associated with both adolescent substance use and early sexual behavior initiation through parental stressors, social support for parents, family functioning, school functioning, perceived peer sexual behavior, and perceived peer substance use. This study contributes to the literature by examining the indirect effects of these processes as well as by evaluating these direct effects in a single comprehensive model, where indirect (mediated) effects can also be examined.

METHOD

Recruitment

Adolescent participants were recruited from one of four predominantly Hispanic middle schools in Miami-Dade County, Florida. The four schools were selected because they were in an urban, highly Hispanic neighborhood of Miami. Recruitment of participants occurred through (a) the distribution of recruitment flyers to students or (b) school counselor referral. Of the 730 eligible participants, 144 refused to participate. Hence, the response rate was 80.3%.

Participants

Participants were 586 Hispanic youth (55.3% male, 44.7% female; M age = 13.6 years, $SD = 0.75$) and their primary caregivers (13% male, 87% female; $M = 41.0$ years, $SD = 6.3$). Of the adolescents, 46% were born in the United States, whereas all of the parents were immigrants (as per the study’s inclusion/exclusion criteria). Immigrant adolescents were born primarily in Cuba (33.8%), Nicaragua (23.6%), and Honduras (13.7%). Of foreign-born adolescents, 43.45% had been living in the United States for fewer than 3 years, whereas the rest had either been living in the United States between 3 and 10 years ($n = 123$; 39.30%) or more than 10 years ($n = 54$; 17.25%). Participants were primarily from low-income families, with only 15.2% of the families’ reporting household incomes greater than \$30,000 per year.

Measures

Parents and adolescents completed the assessment battery in the language of their choice (i.e., Spanish or English). All measures were translated into Spanish by integrating back translation and committee resolution approaches, as recommended (Szapocznik & Kurtines, 1995). Of the adolescents, 59% completed their assessments in English, whereas all parents completed their assessments in Spanish.

The measures section is organized into six subsections. The first section refers to demographic variables and the last subsection refers to HIV risk behaviors (lifetime substance use and lifetime sexual behavior subsections, respectively). The remaining four sections were organized around the systems of ecodevelopmental theory: macrosystem, ecosystem, mesosystem, and microsystem. Table 1 includes a sample item and the answer categories for each of the constructs measured in the study.

Demographics were assessed using a 10-item (adolescents) and 26-item form (parents), on which adolescents and parents provided their date and country of birth and number of years living in the United States. Parents were also asked about their marital status, years of education completed, and family income.

Macrosystemic cultural processes were measured by the parents' U.S. orientation and by the difference between the parents' and adolescents' U.S. orientation (i.e., parent-adolescent U.S. orientation gap). The Bicultural Involvement Questionnaire-Revised (Birman, 1998) was used to assess adolescents' and parents' level of orientation toward American culture in terms of both (a) comfort and enjoyment with American cultural practices (e.g., comfort and use of language, food, and traditions) and (b) how much participants would want or like to use American cultural practices. Of the 21 U.S. orientation items, 20 (all except language use at work) were used for adolescents, and 20 of the 21 U.S. orientation items (all except language use at school) were used for parents. Cronbach's α estimates for the U.S. orientation scores were .92 and .93 for adolescents and parents, respectively. The parent-adolescent U.S. orientation gap score was computed by subtracting the parent's U.S. orientation score from the adolescent's U.S. orientation score.

Exosystemic processes were operationalized as social support for parents and parental stressors. These variables were measured using the Social Provisions Scale (Russell, Cutrona, Rose, & Yurko, 1984) and the *Hispanic Stress Inventory* (Cervantes, Padilla, & Salgado de Snyder, 1991), respectively. The 24-item Social Provisions Scale assesses five domains of social support: guidance, reliable alliance, reassurance of worth, attachment, and social integration. Cronbach's α for the social support scale is .85. The *occupation/economic stressors subscale* (13 items) and the *immigration stressors subscale* (18 items) from the *Hispanic Stress Inventory* were used to assess the parent's degree of extrafamilial stress. Parents were asked to indicate whether, in the past 6 months, they had experienced a number of occupational/economic stressors (e.g., they think their income has not been sufficient to support their family or themselves) and immigration stressors (e.g., they felt unaccepted by others because of their Hispanic culture). Cronbach's α estimates for the parental occupational/economic stress and immigration stress subscale scores were .76 and .79, respectively. A parental stress scale was derived by summing the occupational/economic and the immigration stress subscales. Cronbach's α for this total parental stress score was .78.

Mesosystemic processes were operationalized as parental involvement in school and parental monitoring of peers. Parents' involvement in schoolwork was assessed using one item from the Parenting Practices Scale (Gorman-Smith, Tolan, Zelli, & Huesmann, 1996), asking how often they check how their adolescents are doing at school. Parental monitoring of peers (6 items) was measured using the Parent Relationship With Peer Group Scale (Pantin, 1996), which asks adolescents to indicate the extent to which (a) their parents know their friends, (b) their parents know the parents of their child's friends, and (c) their parents know what their child is doing when he or she is with her or his friends. Cronbach's α for the parental monitoring of peers subscale was .86.

Microsystemic processes were measured in four domains: (a) family functioning, (b) school functioning, (c) perceived peer substance use, and (d) perceived peer sexual behavior. Family functioning was assessed using adolescent reports of four indicators: parental involvement, positive parenting, family communication, and parent-adolescent communication. Although both parents and adolescents reported on the level of family functioning, in our prior work we have found that parent report and adolescent reports of these family functioning indicators do not correlate highly (e.g., Schwartz, Pantin, Prado, Sullivan, & Szapocznik, 2005). Consequently, we used only adolescent reports of family functioning. Parental involvement (11 items, $\alpha = .93$)

and positive parenting (6 items, $\alpha = .94$) were assessed using the corresponding subscales from the Parenting Practices Scale (Gorman-Smith et al., 1996). Family communication (3 items, $\alpha = .75$) was assessed using the corresponding subscale from the Family Relations Scale (Tolan, Gorman-Smith, Huesmann, & Zelli, 1997). Parent-adolescent communication (20 items, $\alpha = .88$) was assessed using the Parent-Adolescent Communication Scale (Barnes & Olson, 1985).

School functioning was assessed using conduct, academic, and absent and tardy reports from teachers as well as two adolescent-reported items and one parent-reported item. Teachers rated the adolescent's conduct, academic performance, absent and tardy through quarterly report cards for each class in which the student was enrolled. Academic and conduct grades were measured on a 5-point scale (A = 4, B = 3, C = 2, D = 1, F = 0). Adolescent reports of school functioning problems were gathered using two items ("I disobey at school" and "My school work is poor") from the Youth Self Report (Achenbach, Dumenci, & Rescorla, 2002). On the Youth Self Report, adolescents responded on a 3-point Likert-type scale ranging from 0 = *not true* to 2 = *very true or often true*. Cronbach's α for responses to these two items was .78. Parent reports of their adolescent's school functioning were assessed using one item from the Revised Behavior Problem Checklist (Quay & Peterson, 1993). Parents indicated the extent to which their child's "school work is messy, sloppy." Responses were rated on a 3-point scale (0 = *no problem*, 1 = *mild problem*, 2 = *severe problem*).

Perceived peer substance use (three items, $\alpha = .80$) was measured using adapted substance use items from the Monitoring the Future Survey (Johnston et al., 2008). The substance use items were adapted by replacing "have you" with "how many of your friends have." Adolescents were asked how many of their friends have ever smoked cigarettes, used alcohol or any illegal drug in their lifetime. Similarly, perceived peer sexual behavior was assessed using one item from the Interview for Situations of Sexual Possibility (Paikoff, Parfenoff, Williams, & McCormick, 1997). Adolescents indicated whether, in a private place, their friends have had sexual intercourse with one another.

HIV risk behaviors were measured in terms of adolescent lifetime substance use (alcohol, cigarette, or illicit drug use) and early sex initiation. Adolescent substance use (three items; $\alpha = .64$) was assessed using items similar to those used in the Monitoring the Future Study, a national epidemiologic study to assess the prevalence of substance use in the United States (Johnston et al., 2008). The adolescents were asked whether they had ever smoked, drank alcohol, or used an illicit drug. Lifetime sexual behavior (three items; $\alpha = .99$) was assessed using the Sexual Behavior Instrument (Jemmott, Jemmott, & Fong, 1998). Adolescents were asked to indicate whether they had ever had oral, vaginal, or anal intercourse.

Data Analytic Plan

The test of the study hypotheses proceeded in three steps. First, measurement models were estimated to ascertain the feasibility of collapsing multiple indicators of family functioning, school functioning, and parental social support into single latent variables (all other variables were measured using observed variables). This was done by conducting confirmatory factor analyses (CFA) using *Mplus* version 5.1 (Muthén & Muthén, 1998-2006). Second, we estimated the hypothesized structural equation model (see Figure 1). The fit of the model was evaluated primarily in terms of the comparative fit index (CFI), which compares the hypothesized model to a null model with no paths or latent variables, and the root mean square error of approximation (RMSEA), which estimates the extent to which the covariance matrix specified in the model deviates

from the covariance matrix observed in the data. The chi-square statistic is reported but is not used in the interpretation, given that it tests the null hypothesis of perfect fit to the data—which is nearly always false (Preacher, Cai, & MacCallum, 2007). CFI values of .95 or greater and RMSEA values of .06 or less are indicative of good model fit (Byrne, 2001). Third, the asymmetric distribution of products test (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002) was used to evaluate each of the hypothesized mediational relationships. This test is based on the sampling distribution of the product of the paths that comprise the hypothesized mediating pathway. If the confidence interval for this product does not include 0, then partial mediation is assumed. This method is more statistically powerful (MacKinnon, Fritz, Williams, & Lockwood, 2007) than more traditional methods of testing for mediation.

RESULTS

Measurement Models

Family Functioning. A CFA indicated that all four indicators of family functioning loaded significantly onto a single latent construct. The loadings were .74, .59, .69, and .69 for parent–adolescent communication, parent involvement, positive parenting, and family communication, respectively. Because the model was saturated (i.e., had 0 degrees of freedom), fit statistics are not reported.

School Functioning. Seven indicators (four teacher reported, two adolescent reported, and one parent reported) were included in this measurement model. The model provided a good fit to the data, $\chi^2(3) = 5.03$, $p = .17$; CFI = .99; RMSEA = .034. All seven indicators loaded significantly onto a single latent construct. These loadings ranged from .30 to .66.

Parental Social Support. Five indicators (guidance, reassurance of worth, social integration, attachment, and reliable alliance) were included in this measurement model. The model provided a good fit to the data, $\chi^2(4) = 13.1$, $p = .01$; CFI = .99; RMSEA = .06. All seven indicators loaded significantly onto a single latent construct. These loadings ranged from .71 to .85.

Structural Equation Model—Hypothesized Model

Overall, the hypothesized model depicted in Figure 1 provided an adequate fit to the data, $\chi^2(89) = 194.0$, $p < .01$; CFI = .93; RMSEA = .05. The results for each of the hypothesized relationships are reported below. Only significant direct effects are shown in Figure 2.

Direct Effects: Macrosystemic Processes to Exosystemic Processes. Parent's U.S. orientation was inversely and significantly related to social support for parents ($\beta = -.16$, $p < .01$) and to parental stressors ($\beta = -.17$, $p < .01$).

Macrosystemic Processes to Microsystemic Processes. Both parents' U.S. orientation ($\beta = -.44$, $p < .001$) and differential parent-adolescent U.S. orientation ($\beta = -.24$, $p < .001$) were inversely related to family functioning.

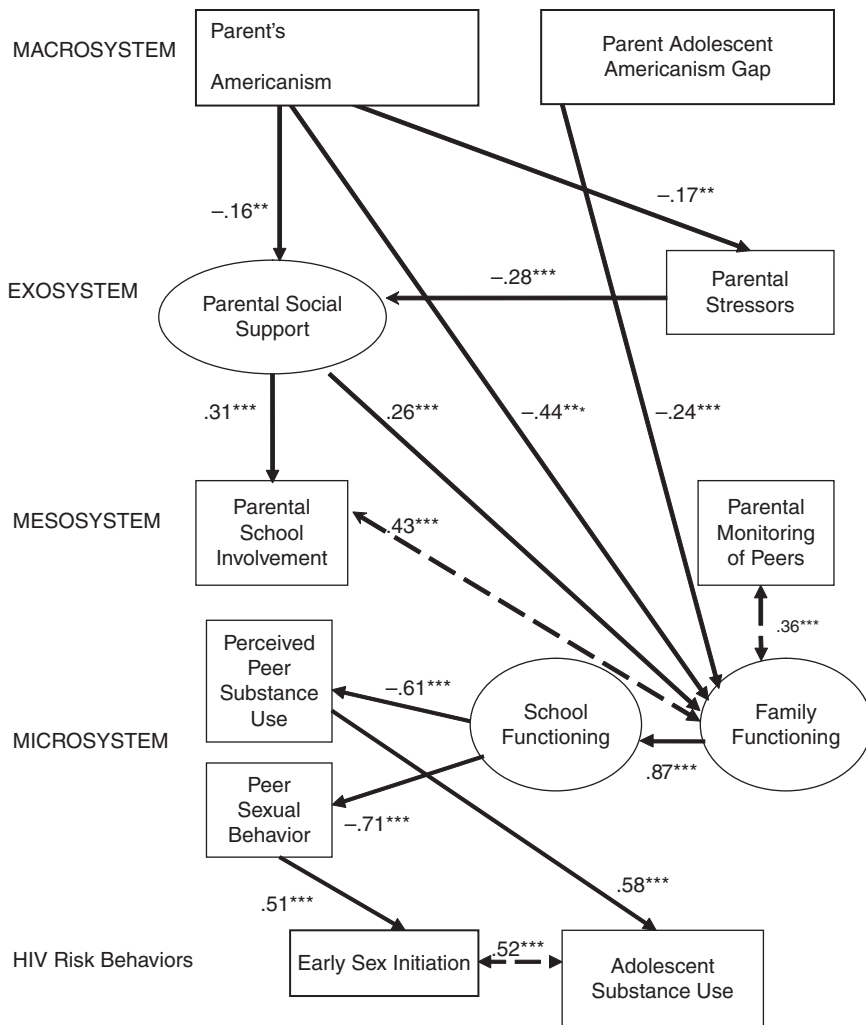


Figure 2. Results of the hypothesized ecodevelopmental model in predicting HIV risk behaviors. * $p < .05$. ** $p < .01$. *** $p < .001$.

Exosystemic Processes to Mesosystemic Processes. Social support for parents was positively related to parental school involvement ($\beta = .31, p < .001$) but was not significantly related to parental monitoring of peers. Parental stressors were not significantly related to either parental school involvement or parental monitoring of peers.

Exosystemic Processes to Microsystemic Processes. Social support for parents was positively related to family functioning ($\beta = .26, p < .001$).

Mesosystemic Processes to Microsystemic Processes. Both parental school involvement ($\beta = .43, p < .001$) and parental monitoring of peers ($\beta = .36, p < .001$) were positively associated with family functioning. Surprisingly, parental school involvement was not significantly related to school functioning. Parental monitoring of peers

was also not significantly related to perceived peer substance use and perceived peer sexual behavior.

Microsystemic Processes to HIV Risk Behaviors. Perceived peer substance use was positively related with adolescent substance use ($\beta = .58, p < .001$). Perceived peer sexual behavior was positively related with early sex initiation ($\beta = .51, p < .001$). We did not observe significant direct effects from family functioning and school functioning to either adolescent substance use or early sex initiation.

Relationships Between Microsystemic Processes. Family functioning was positively related with school functioning ($\beta = .87, p < .001$), and school functioning was inversely related with perceived peer substance use ($\beta = -.61, p < .001$) and perceived peer sexual behavior ($\beta = -.71, p < .001$).

Indirect Effects. Four indirect effects between macrosystemic processes and each of the two HIV risk behaviors were tested and found to be significant. The results showed that parent's U.S. orientation and early sex initiation use were indirectly related through parental stressors, social support for parents, family functioning, school functioning, and perceived peer sexual behavior (point estimate, $\beta = -.004, p < .05$; 95% CI: [-0.001 to -0.0001]). Similarly, parent's U.S. orientation and adolescent substance use were indirectly related through parental stressors, social support for parents, family functioning, school functioning, and perceived peer substance use (point estimate: $\beta = -.004; p < .05$. 95% CI: [-0.001 to -0.0001]). Additionally, differential parent-adolescent U.S. orientation and early sex initiation were significantly related through family functioning, school functioning, and perceived peer sexual behavior (point estimate: $\beta = .008; p < .05$; 95% CI: [0.002 to 0.014]). Similarly, differential parent-adolescent U.S. orientation and adolescent substance use were significantly related through family functioning, school functioning, and perceived peer substance use (point estimate: $\beta = .007; p < .01$; 95% CI: [0.003 to 0.012]).

Post Hoc Analyses

To examine whether the observed association vary across gender and nativity status (i.e., U.S. born vs. foreign born), in post hoc analyses, we tested for model invariance by both gender and nativity status (U.S.-born versus immigrant). To test for invariance by gender, we estimated two models: (a) a model with the paths unconstrained across genders and (b) a model with the paths constrained across both genders. To examine the difference between these two models, we used the difference in chi-square test using the "DIFFTEST" function in *Mplus*. We found that the difference in chi-square between the constrained and the unconstrained model was nonsignificant, $\Delta\chi^2(16) = 12.64, p = .70$. This implies that the model fits equally across gender. Similarly, for nativity status, we found that the difference in chi-square between the constrained and the unconstrained model was nonsignificant, $\Delta\chi^2(17) = 21.14, p = .22$. This implies that the model fits equivalently across U.S.-born and immigrant adolescents.

DISCUSSION

The objective of this study was to empirically evaluate ecodevelopmental theory and more specifically to test the trickle-down effect within ecodevelopmental theory.

Ecodevelopmental theory is a theoretical framework used to explain the interplay among the risk and protective processes associated with substance use and early sexual behavior initiation among Hispanic adolescents. The results from this study support the hypothesized model and trickle-down effects of the theory. First, parent adolescent acculturation gap was indirectly related to both early sex initiation and adolescent substance use through family functioning, academic functioning, perceived peer sexual behavior, and perceived peer substance use. Similarly, parents' level of acculturation was associated with adolescent substance use and sex initiation and adolescent through social support for parents, parental stressors, family functioning, academic functioning, and perceived peer sexual behavior and substance use. Thus, the trickle-down effects of ecodesvelopmental theory were supported. This suggests that macrosystemic processes can influence behavioral health outcomes—such as substance use and early sexual behavior—through their associations with exosystemic, mesosystemic, and microsystemic processes. From a prevention science perspective, it may be suggested that preventive interventions targeting macrosystemic processes can have an effect on behavioral health through the indirect effects that macrosystemic processes may have on other, more proximal systemic processes. For example, Szapocznik and colleagues (1986) demonstrated that targeting cultural orientations (a macrosystemic process) could produce effects on behavioral health outcomes. In that study, the intervention used cultural orientations as a means of changing family functioning, which consequently had an effect on adolescent conduct problems.

In terms of the direct effects examined, the results of the model support the existing empirical and/or clinical literatures. For example, the finding that parent's U.S. orientation was inversely associated with parental stress is consistent with previous studies (Scribner, 1996; Turner, Lloyd, & Taylor, 2006). Additionally, parent's U.S. orientation was inversely related with social support for parents. Thus, U.S. orientation may also be related to stress for parents, such that becoming more "American"—and perhaps beginning to relinquish their Hispanic culture—may be associated with greater levels of stress and a smaller social support network.

Another important finding is that differential acculturation was inversely related to family functioning. Differential acculturation promotes risk for substance use and other problem behaviors in Hispanic immigrant adolescents because it creates additional familial conflict that undermines adolescent bonding to the family and erodes parental authority (Martinez, 2006). The finding is consistent with recent work conducted in Oregon using a sample of relatively recent Hispanic immigrants. In that study, Martinez (2006) found a significant relationship between differential acculturation and likelihood of adolescent substance use.

The finding that parental monitoring of peers was not related with either adolescent substance use or sexual behavior initiation was unexpected and contrary to what others have found (Borawski, Ievers-Landis, Lovegreen, & Trapl, 2003; Voisin, DiClemente, Salazar, Crosby, & Yarber, 2006). In this study, the lack of relationship between parental monitoring of peers and both substance use and early sex initiation may be explained by the fact that monitoring has been conceptualized as a component of family functioning (Dishion & McMahon, 1998); including family functioning in the model may have attenuated the association between parental monitoring and adolescent outcomes.

Study Limitations and Strengths

These results should be interpreted in light of several important limitations. First, this study used a cross-sectional design, and the role of the ecodesvelopmental processes on substance use and early sex initiation were not examined over time. As a result, no

causal or directional inferences can be drawn from the results. It is important, therefore, to replicate these results longitudinally. A related limitation to the cross-sectional nature of the study is that we were not able to examine the developmental element of ecodevelopmental theory. As a result, we were able to test only the social-ecological component of ecodevelopmental theory. However, these results may provide a springboard for longitudinal research that may test the theory more fully.

A second limitation involves the sole reliance on self-report measures. Independent reports of family connectedness and parental involvement (e.g., observational tasks) and of HIV risk behaviors (e.g., biological assays for substance use) were not available. Although self-reports tend to converge reasonably well with biomarkers of drug use in minority adolescents (Dillon, Turner, Robbins, & Szapocznik, 2005), there is evidence that some adolescents provide false negative reports of drug use (Santisteban et al., 2003). However, prior research (e.g., Metzger et al., 2000) has found that A-CASI, the method of administration used in this study, increases the veracity of responding. Finally, some adolescents may not be aware that they have a sexually transmitted disease, and those who are aware may not be willing to disclose this information. Nonetheless, significant findings—consistent with theory—emerged despite the possibility of false negative reports of drug use and sexually transmitted diseases.

A third limitation is that both peer substance use and adolescent substance use were reported solely by the adolescent. Consequently, it is possible that the association between (perceived) peer substance use and adolescent substance use may have been inflated by the tendency for adolescents to assume that they and their peers are engaging in similar degrees of substance use (Bauman et al., 2001; Prinstein & Wang, 2005). A fourth limitation is that only one item was available to assess the parent–school mesosystemic construct (i.e., parents' involvement in schoolwork). Future research should replicate these findings with a validated scale of parents' involvement in schoolwork. A final limitation is that very specific constructs were used to assess the systemic processes associated with ecodevelopmental theory. That is, given the breadth of ecodevelopmental theory as a whole, it may be possible to choose different variables at each level, and we do not know how this might affect the results. For example, parental documentation status is an important macrosystemic process that may contribute to parental stress and other mesosystemic processes. However, our constructs and measures were selected specifically to test the trickle-down, U.S.-orientation hypotheses within ecodevelopmental theory. These issues notwithstanding, the pattern of results that we obtained is consistent with theory and with past research using well-validated measures.

Conclusions and Practical Implications

Ecodevelopmental theory is a theoretical framework used to explain the interplay among risk and protective processes associated with HIV risk behaviors among adolescents. This study provides some support for the theoretical model, and from an intervention development perspective, these results may suggest that interventions targeting reductions in substance use, early sex initiation, and other HIV risk behaviors may benefit from an ecodevelopmental approach. Ecodevelopmental principles have been applied successfully to adolescent substance use and HIV preventive interventions across ethnic groups (Ialongo et al., 1999), including with Hispanic adolescents (Prado et al., 2007). The utility of the ecodevelopmental interventions may also hold promise for preventing other behavioral health problems, such as obesity. The present findings may have implications for public health practitioners who may be interested in developing social-behavioral interventions to prevent or reduce HIV risk behavior and other

health outcomes. For example, the findings from this study suggest that attending to cultural processes such as parents' U.S. orientation and the parent–adolescent acculturation gap may prevent adolescent substance use and early sexual behavior initiation. As such, public health practitioners may need to attend to these cultural processes when developing or delivering interventions for Hispanic youth and their families (Prado et al., 2008). Alternatively, promoting positive parent–adolescent relationships may prevent the negative consequences that are often associated with a parent–adolescent acculturation gap. To the extent to which health outcomes can be linked to ecosystemic processes—and especially to chains of associations among processes at different systemic levels—ecodevelopmentally based interventions may be especially valuable in preventing these outcomes.

Finally, it is important for health educators to appreciate the cultural, occupational, and education-related stressors on parents. In efforts to prevent adolescent substance use and HIV risk behavior, it is essential to provide support resources (e.g., job placements, mental health services) for parents so that they are more able to focus on their adolescents. Parents should also be helped to monitor the adolescent's schoolwork and peer activities (Pantin et al., 2004). Moreover, family-based strategies for promoting effective communication, positive involvement, and support within the family are essential to the health of Hispanic adolescents (Prado et al., 2007).

Note

1. Acculturation refers to the process of adaptation that occurs when two cultures come into contact (Redfield, 1936). It has been most often used with reference to immigrants and their descendants (see Berry, Phinney, Sam, & Vedder, 2006; Chun, Balls-Organista, & Marin, 2003, for collections of reviews). In this study, acculturation is defined as orientation toward the American culture.

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