Acculturation, Family Context, and Mexican Origin Youth Substance Use Risk Across Time

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Abstract

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Latino youth, and Mexican-origin youth in particular risk, may be at higher risk for early substance use initiation. Given that early initiation is related to greater likelihood of later substance use problems, understanding risk and protective pathways for this early use is of great importance. Acculturation (i.e., American cultural identity) has been identified as a cultural risk factor for adolescent substance use for Mexican-origin youth. On the other hand, increased orientation to heritage Mexican culture appears to play a protective role in the development of substance use.

Theory has suggested that acculturation and enculturation are *processes* that dynamically change over time, yet there is a dearth of longitudinal research on cultural orientation development. Moreover, there is limited research examining whether youth substance use changes as a function of changes in cultural orientation. One mechanism that appears to partially

explain the link between youth cultural orientation and substance use is disrupted family dynamics (e.g., Samaniego & Gonzales, 1999; Szapocznik & Kurtines, 1993). However, there is a dearth of longitudinal studies examining the pathway that links cultural change with youth substance use via family dysfunction.

The specific aims of this dissertation were to examine and characterize longitudinal changes in cultural orientation over time, examine links between cultural orientation level and change with substance use outcomes and to test whether family processes may mediate the links between cultural orientation change and negative outcomes. The study used data from 674 Mexican-origin youth and their parents across five (approximately) yearly observations between ages 10 - 15. This study used measures of youth report of cultural orientation, substance use, and family dynamics up to age 15. I used latent growth modeling (LGM) in a Structural Equation Modeling framework, applied categorical and count data modeling to appropriately specify substance use outcomes, and examined mediation in a LGM context.

Results suggested that cultural orientation change is a dynamic process that varies across individuals, and patterns of change depend on the particular cultural domain being examined. Although the results suggested that there were some links between level and change in cultural orientation with substance use outcomes, these findings were less robust in the current study potentially due to missing data characteristics. Still, results demonstrated that family relationship characteristics represent a robust mechanism that indirectly link initial levels and change in cultural orientation with substance use outcomes. I interpret my findings within a cultural risk and resilience framework, and integrate with prior research to inform the acculturation literature.

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Chapter 1: Introduction to Dissertation Study

Background and Significance

Substance use and abuse are significant problems for youth in the Latino community. Large epidemiological surveys suggest that Latino youth are more likely to use a variety of substances at earlier ages than their White or Black counterparts (Centers for Disease Control and Prevention [CDC], 2010; Johnston et al., 2011). This is especially important given evidence that early substance use initiation is related to later substance use problems (Hawkins, Catalano, & Miller, 1992; Hawkins, et al., 1997), and other consequences, including academic problems (Hanna, Yi, Dufore, & Whitmore, 2001; King, Meehan, Trim, & Chassin, 2006), antisocial behavior (Swahn, Bossarte & Sullivent, 2006), internalizing problems (Trim, Meehan, King, & Chassin, 2007), suicidal ideation (Duncan, Alpert, Duncan & Hops, 1997) and risky sexual behavior (Guo et al., 2002). Adolescent substance use is associated with primary causes of youth morbidity and mortality, including accidents, homicide and suicide (U.S. Department of Health and Human Services, 2007), and can also lead to legal consequences in the form of DWI arrests, or arrests for illicit drug possession, which can have enormous consequences on an adolescent's life. Early and chronic substance use across adolescence may also increase the risk of later health problems (e.g., Aarons et al., 1999; Oesterle et al., 2004), and also have negative consequences on the developing brain (Brown & Tapert, 2004; DeBellis et al., 2000, 2005; Nagel, Schweinsberg, Phan & Tapert, 2005). Importantly, Latino youth are already at greater risk for many problems associated with early substance use, including school failure and dropout, and poor mental health (Fry, 2010; Gonzales, Dumka, Deardorff, Carter &McCray, 2004; Kandel, 1995; Martinez, 2006).

This is an increasing cause for concern, given recent figures show that Latinos are the largest and fastest growing group in the United States comprising over 50 million people, or 16% of the total population in the United States (Humes, Jones, & Ramirez, 2011). The Latino population is predicted to account for 30% of the population by the year 2050 (US Census Bureau, 2008), and a large proportion of the Latino population growth will be among youth under 18 (Fry & Gonzales, 2008; Pew Hispanic Center, 2011). Indeed, the Pew Hispanic Center (2011) reported that the Latinos now make up almost a quarter of children age 17 and younger, and this proportion is already much higher in states such as California. Mexican-origin (MO) individuals constitute 63% of the United States Latino population (Humes, Jones, & Ramirez, 2011). The MO population is also younger on average, with about one-third of individuals under the age of 18, compared to one-fifth of non-Hispanic Whites (U.S. Census Bureau, 2007). Thus, there are an expanding number of Latino youth with increased risk for substance use and MO youth have particular vulnerability. Understanding the pathways for substance use in this group is an area of particular importance in order to develop effective and efficient prevention and treatment efforts.

Studying Risk and Resilience Processes within Developmental Context

Substance use can be conceptualized as a developmental phenomenon (Kandel, 2002; Masten, Faden, Zucker, & Spear, 2008; Sher, 1991; Tarter, 2002; Tarter & Vanyukov, 1994) with some progressing from initiation and experimentation to a regular use pattern, and potentially, the development of substance use problems over time. I broadly contextualize the study of adolescent substance use pathways by drawing on several overlapping models that speak to the complex matrix of biopsychosocial factors that are relevant to substance use etiology. First, Bronfenbrenner's Bioecological Development model (Bronfenbrenner, 2005) is a

useful overarching framework to conceptualize the many levels of context, from proximal constitutional factors such as genetics and temperament, to the family and peer system, and broadening to macrosystemic factors such as culture, all of which may influence adolescent substance use. An essential element of the Bioecological Development model is the transactional nature of the different levels of influence. Second, Cicchetti's developmental psychopathology model (Cicchetti & Rogosch, 2002) posits a similar multi-factorial transacting system of influences that interact in the form of developmental pathways, which unfold during the developmental course of adolescence to promote or reduce vulnerability for substance use initiation and progression. Finally, Structural Ecosystems Theory (Szapocznik & Coatsworth, 1999) and García Coll's integrative model of child development (García Coll et al., 1996) similarly propose multiple levels of transactional influences, and places the family at the epicenter of the child's social environment and development with an emphasis on the social and cultural contexts and stressors that can enhance risk for negative outcomes or support family and youth resiliency.

There are number of risk and protective factors that influence adolescent substance use (Hawkins, Catalano & Miller, 1992), and it appears that there is a significant degree of common variance shared by the factors underlying alcohol, tobacco, and other drug (ATOD) use (Iacono, Malone & McGue, 2008; Vanyukov et al., 2003). Factors that appear to play a role range from biological factors, such as genetic predisposition (e.g., Vanyukov & Tarter, 2000), family history of ATOD problems (e.g., Hawkins et al., 1997; Chassin, Pitts & Prost, 2002), to personality factors such as impulsive, disinhibited temperaments (e.g., Chassin, Flora & King, 2004; Sher, 1991; Sher, Grekin, & Williams, 2005); early behavior problems on the externalizing spectrum (e.g., Guo, Hawkins, Hill & Abbott, 2001; McGue, Iacono, Legrand, Malone & Elkins, 2001);

peer factors (e.g., Guo et al. 2002); as well as school level factors, such as school bonding (e.g., Guo et al., 2001).

Developmental theories of substance use etiology (e.g., Cloninger, 1987; Sher, 1991) have suggested that environmental factors modulate genetic and temperamental risk. For example, one of Sher's (1991; Sher, Grekin & William, 2005) developmental pathways, the *deviance proneness pathway,* posits that adolescents at genetic risk for substance use disorders have "difficult" early temperaments, and higher likelihood of cognitive deficits, which together result in decreased self-regulatory abilities, greater impulsivity, and higher sensation seeking (Clark & Winters, 2002; Dawes et al., 2000; Nigg, 2000; Tarter, Kirisci, Habeych, Reynolds, & Vanyukov, 2004; Thatcher & Clark, 2010; Zucker, Heitzeig & Nigg, 2011). These high-risk children are also likely to receive ineffective parenting, and to experience academic problems, peer rejection by prosocial peers and affiliation with deviant peers, who provide the means and approval of substance use. This model suggests that genetics and personality characteristics set the foundation for substance use risk, but that this risk is modified by environmental factors. However, as described below, general etiological models tended to take a "one-size fits all" approach and neglect important cultural and contextual influences experienced by ethnic minority youth (D'Amico, Tucker, Shih, & Miles, 2014), such as socialization of cultural values and traditions, challenges presented by the acculturation process, and experiences of discrimination (Chassin, Hussong, & Beltran, 2009; García Coll, Akerman & Cicchetti, 2000; Yasui & Dishion, 2007) that may also influence substance use development by modifying environmental risk.

Adolescence is a Crucial Developmental Period

The developmental period of adolescence has garnered increasing recognition as a crucial time that sets the stage for important health outcomes into adulthood (Sawyer et al., 2012). The transition from late childhood to adolescence represents an ideal opportunity to study the onset and effects of early substance use initiation, as research has indicated that many youth initiate ATOD use in adolescence around the ages of 13-14 (Faden, 2006; Johnston et al., 2011). In addition, some youth initiate substance use even earlier, and there have been calls to study the precipitating factors that may lead to very early use (Donovan, 2007). For example, substance use intentions represent a key precursor of early substance use. The Theory of Planned Behavior (Ajzen, 1991; Marcoux and Shope, 1997) suggests that attitudes, norms and perceived behavioral control are related to substance use intentions, which in turn shape substance use behavior over time (e.g., Andrews, Tildesley, Hops, Duncan & Severson, 2003; Huba, Wingard & Bentler, 1981; Wolford & Swisher, 1986). Many of the predisposing factors related to substance use development are already in place during childhood (Zucker et al., 2008) Thus, the transition from childhood to adolescence represents a unique developmental period to study not only initiation of substance use, but also precursors to substance use including substance use intentions.

The transition from childhood to adolescence is characterized by a number of biopsychosocial changes unique to this developmental period. First, the onset of puberty, characterized by hormonal changes and sexual maturation (Spear, 2000), is an important hallmark of the transition to adolescence. Notably, research has found that early puberty is a risk factor for early substance use initiation (e.g., Patton et al., 2004). A growing body of evidence also suggests that there are substantial neurodevelopmental changes taking place (Crews, He, & Hodge, 2007; Giedd et al., 1999; Paus, 2005, Spear, 2002; Witt, 2010). These changes may not only increase vulnerability for increased substance use (Dahl, 2004; Steinberg, 2005), but also

exacerbate potential structural and neuropsychological consequences of substance use on the developing brain (e.g., Brown & Tapert, 2004; DeBellis et al., 2005).

In addition, adolescence is also a time of increasing independence, as youth move from the primary socializing environment, the family, and into the broader social milieu. Peers begin to take on increasing importance during adolescence (Spear, 2000; Steinberg & Morris, 2001), and as youth progress through different developmental contexts, transition from elementary to middle school, then to the high school setting, they concurrently begin to develop their identity and role in society, while accomplishing important developmental tasks (Masten et al., 2008). These social changes often serve to increase access to ATOD, as well as the opportunities for youth to engage in ATOD use. Not surprisingly, the adolescent period is a critical time when positive drug use norms, expectations and intentions also begin to emerge (Elek, Miller-Day & Hecht, 2006).

The Importance of the Family System

Developmental research is most effective when clearly identifying modifiable factors that can be directly targeted in clinical intervention. Of particular importance in the transition from childhood to adolescence is the family environment. The family is a primary socializing agent in the child's life (Cummings, Davies, & Campbell, 2000; Szapocznik & Coatsworth, 1999), and may play a role in children's substance use development via multiple mechanisms, both direct and indirect (Hawkins et al., 1992). Risk factors for substance use include ineffective parenting (Baumrind, 1991; Curran & Chassin, 1996) and family conflict (Maggs, Patrick & Feinstein, 2008; Wills et al., 2001; Zhou, King & Chassin, 2006). On the other hand, parental monitoring or knowledge (Guo et al., 2001; Hawkins et al., 1992; Ryan, Jorm, & Lubman, 2010) and family cohesion (Duncan, Tildesley, Duncan, & Hops, 1995; Zhou, King, & Chassin, 2006) have been

found to have protective effects related to substance use development. Overall, parenting that combines high levels of warmth, nurturance, and support, along with consistent firm discipline, positive parent-child communication, and overall effective family management practices is associated with lower risk for adolescent substance use (Hawkins et al., 1992; Patock-Peckham, Cheong, Balhorn, & Nagoshi, 2001, Ryan et al., 2010). Moreover, caregivers serve as important sources of modeling and norms for substance use (Donovan & Molina, 2008; Mares, van der Vorst, Engels & Lichtwarck-Aschoff, 2011; Van der Vorst, Engels, Meeus & Deković, 2006).

Characteristics of the family system can mediate the relation between pre-morbid substance use liability, as when children who are temperamentally difficult reinforce negative interaction patterns with caregivers, but can also act as a moderator by increasing or decreasing liability, for example, the positive effects of parental support buffering the negative impact of stressful life events (Kumpfer & Bluth, 2004; Wills & Yaeger, 2003). The negative role of caregivers on development of substance use can be direct as in providing opportunities for children or teens to sample alcohol (Donovan & Molina, 2008; Catalano, Kim, Toumbourou & Hemphill, 2011), but often happens through indirect pathways as predicted by Sher (1991), such as poor monitoring of the child which allows the child more opportunities to interact with deviant peers in settings where experimentation and use of substance may begin (Guo et al., 2001). Thus, it is fitting that the family environment is often a primary target of prevention and intervention programs (Kumpfer, Alvarado & Whiteside, 2003).

The Role of Culture In Models of Substance Use Development

Cultural processes may provide unique understanding of Latino youth substance use risk and resilience (Cauce, 2002; Yasui & Dishion, 2007), in part due how these processes dynamically shape characteristics of the family environment (Cauce, 2008; Hardaway & Fuligni,

2006; Rogoff, 2003; Yasui & Dishion, 2007). Although cultural socialization and processes define human development (García Coll et al., 1996; Rogoff, 2003; Super & Harkness, 1986), paradoxically, culture has often been discounted due to its global and pervasive nature (Shore, 2002). I define culture as shared meanings, understandings or referents held by groups of people (Schwartz, Unger, Zamboanga, & Szapocznik, 2010 cf. Shore, 2002; Triandis, 1995). Within Latino families, cultural norms and patterns may accentuate the importance of the family environment on substance use risk.

For example, Latino families generally tend to have strong family values orientation, known as *familismo*, which emphasizes strong and harmonious bonds within the nuclear and extended family (Baca Zinn, 1994; Cauce & Domenech-Rodgriguez, 2002). Latino families also tend to emphasize the importance of respecting parents, elders, and authority figures, a value known as *respeto* (Keefe & Padilla, 1987). Furthermore, Latino youth tend to place strong emphasis on family obligations and assistance (Fuligni, Tseng, & Lam, 1999; Hardaway & Fuligni, 2006; Kiang & Fuligni, 2009; Yahirun, Perreira & Fuligni, 2013). Indeed, the traditional strength of the family among Latinos suggests that heritage culture may shape family processes to decrease risk for youth substance use over time; however, disruptions to the family system likely exacerbate the risk of substance use.

Importantly, the U.S. Latino population is neither monolithic nor static, as it is made up of diverse groups from many countries, ranging from North America (Mexico), to the Caribbean (e.g., Puerto Rico and Cuba), Central America (including Costa Rica, Honduras and Panama), and South America (e.g., Colombia and Peru) (Ennis, Rios-Vargas, & Albert, 2011). Because Latinos with different national origins typically have very different cultural, historical and racial backgrounds (Cauce & Domenech-Rodríguez, 2002), it is important to study variation across

subgroups of Latinos and variation within the large Mexican-origin population. The current study focuses on examining within-group variation among Mexican-origin (MO) youth and families, who make up the largest subgroup of Latinos in the United, constituting 63% of the U.S. Latino population (Humes, Jones, & Ramirez, 2011). Mexican-origin (MO) youth, in particular, have elevated rates of early substance use (Delva et al., 2006; Wallace et al., 2003).

Acculturation is an Essential Aspect of Cultural Context

For Mexican-origin individuals (and Latinos more generally), the acculturation construct represents a within-group factor that contributes to variation across individuals, and cross-sectional studies examining acculturation have demonstrated relatively consistent prediction of substance use risk (Gonzales, Knight, Morgan-Lopez, Saenz & Sirolli, 2002). Acculturation is defined as the changes that take place when an individual comes into contact with a culture that is discrepant from their own (Berry, 1997, 2003). Acculturation is particularly relevant for individuals who have immigrated to the U.S. from a different country, and this is of key importance as 36% of the U.S. MO population was born in Mexico. However, the acculturation construct is not limited to immigrants, but can also be applied to children who were born in a Latin American country and brought to the U.S. by their parents at a very early age, also termed the "1.5 generation" (Portes & Rumbaut, 2001), the U.S. born children of first-generation immigrants, and even later generations (Schwartz et al., 2010) in regions such as the Southwestern United States (Kulis, Marsiglia, Sicotte, & Nieri, 2007), because of dual socialization in Latino and American culture in these ethnic enclaves. Acculturation is a key within-group factor that is thought to at least partially explain the *Hispanic Immigrant Paradox,* in which health indicators, psychiatric disorders, substance use, and risk behaviors tend to be higher among individuals born in the U.S., individuals who immigrated to the U.S. at earlier

ages, and individuals who have lived for longer periods in the U.S. (e.g., Alegria, Canino, Stinson, & Grant, 2006; Sam, 2006a; Schwartz, Pantin, Sullivan, Prado & Szapocznik, 2006; Vega, Zimmerman, Gil, Warheit & Apospori, 1998). This dissertation examines pathways between acculturation and substance use risk, focusing on the ways that acculturation may shape family dynamics. Before delving into this key pathway for MO youth, I discuss acculturation theory in greater detail.

Theoretical Framework

I conceptualize the acculturation process using Schwartz and colleagues' (2010) integrative framework. In this framework, acculturation is defined as changes in *cultural identity* across both heritage (i.e., Mexican) and receiving (i.e., American) culture statuses. There is general theoretical agreement that acculturation can be conceptualized as a bi-dimensional process (Berry, 2005; Cabassa, 2003), which suggests that acculturation may include both adopting aspects of the receiving (i.e., American) culture, while also selectively retaining aspects of one's heritage culture (Oetting & Beauvais, 1991; Sullivan et al., 2007). These processes have also been labeled as acculturation and enculturation, respectively (e.g., Gonzales, et al., 2002; Knight et al., 2010). The bi-dimensional approach stands in contrast to uni-dimensional models (e.g., Gordon, 1964), which posit that individuals fall on a continuum, ranging from orientation solely towards their culture of origin to complete immersion into the host culture.

Schwartz and colleagues' (2010) integrative acculturation framework further posits that cultural identity, along either axis, is further divided into separate components, including practices, values, and identifications, and each component encompasses multiple domains. Cultural practices include domains such as language use, celebration of holidays and customs, food and media preferences, and social affiliation preferences and behaviors. Values are a key

aspect of culture (e.g., Schwartz, 1999), and the literature traditionally cites heritage Mexican values related to collectivism, traditional family values (i.e., *familismo*), traditional gender roles, including *machismo and marianismo,* religious beliefs, fatalism and folk illness beliefs, interpersonal values such as *personalismo* and *simpatia* (e.g., Cauce & Domenech-Rodriguez, 2002; Knight et al., 2010). "Mainstream" American cultural values have been discussed much less in the literature, however, more recent research has identified individualism or independence, materialism and competition as overarching American values (Knight et al., 2010). Finally, the identification component of cultural identity is made up of ethnic and national identities (Phinney, 2003; Tropp, Erkut, Garcia Coll, Alarcon, & Garcia, 1999). This conceptualization is in line with past models that postulate that acculturation is evidenced by changes in behavioral, affective, and cognitive domains (Berry, 2003; Cuellar, Arnold, & Gonzalez, 1995; Cuellar, Arnold & Maldonado, 1995; Félix-Ortiz, Newcomb, & Myers, 1994; Phinney & Flores, 2002; Sam & Berry 2010). Each of these components and dimensions are potentiated for change during the acculturation process, although, importantly, theory suggests that the degree and rate of change may vary across dimensions and may depend on characteristics of the receiving and heritage culture (Berry, 2003; Schwartz et al., 2010).

Another prevailing theoretical proposition in the acculturation literature is Berry's (1980, 2006; Sam & Berry, 2010) conceptualization of *acculturation strategies*. This conceptualization divides the axes of bi-dimensional acculturation (i.e., heritage versus receiving cultures) along their midpoints into four acculturation categories, including integration, assimilation, separation, and marginalization. Individuals who are *integrated* adopt elements of the receiving culture while maintaining many aspects of their culture of origin. *Assimilated* individuals adopt many of the receiving culture practices, values, and beliefs while shedding many of their own. Those who

are *separated* maintain their culture of origin and do not adopt elements of the receiving culture. Finally, *marginalized* individuals have neither the elements of their culture of origin nor the receiving culture. Recent research (e.g., Schwartz & Zamboagana, 2008) has shown a moderate degree of validity for these categories. Although the categorization of individuals to discrete acculturation strategy categories has frequently been used to empirically examine acculturation, and provides a way to examine bidimensional cultural orientation (Arends-Tóth & van de Vijver, 2006), categorization not only reduces sample variability when drawing on continuous measures of acculturation, but also is typically based on sample-specific criteria for decisions about categorization (DeCosta, Iselin & Gallucci, 2009; MacCallum, Zhang, Preacher & Rucker, 2002). Although I do not directly examine acculturation strategies, I do utilize this conceptualization for guidance in the execution and interpretation of this current research study.

Cultural Orientation Change as a Developmental Process

It is important to differentiate *cultural orientation,* a static snapshot of an individual's endorsement of a cultural domain at a particular time point, from *acculturation* and *enculturation*, which are theorized to be dynamic processes that unfold over time (Berry, 1997; 2006). Changes in different cultural domains may occur at different rates across the lifespan and likely depend on contextual and developmental factors (Berry, 2003; Gibson, 2001; Knight et al. 2010; Schwartz et al., 2010). Yet, there is a dearth of longitudinal studies on cultural change (Fuligni, 2001), and cross-sectional studies have a longstanding history of erroneously equating between-person variation with individual cultural change. Cross-sectional studies can only provide a snapshot of variation in acculturation level and do not capture within-person change, which is a much more fruitful avenue for understanding individual pathways in the development

of substance use risk. Thus, one basic need in the acculturation literature is to examine characteristics of cultural change.

Late childhood and adolescence may be a particularly important time to study the acculturation process as youth engage undergo multiple transitions in roles, contexts and identity and develop a greater awareness of cultural milieus and their ethnic and cultural selves (Daniel et al., 2012; Lopez, 2009; Knight et al., 2010; Knight et al., 2013; Phinney, 1990; Umaña-Taylor, Gonzales-Backen & Guimond, 2009). In addition, theorists have suggested that acculturation changes occur most rapidly for children (e.g., Szapocznik & Kurtines, 1993; Szapocznik, Scopetta, Kurtines, and Aranalde, 1978; Vega & Gil, 1999). Thus, sensitivity to capture cultural change processes may be ideal during the transition from childhood to adolescence, and these processes should be interpreted in developmental context (Fuligni, 2001; Sam, 2006b).

In recent years, several longitudinal studies with Latino youth have emerged using latent class growth analysis, a growth mixture modeling technique, to characterize patterns of cultural change and demonstrate that there is between-individual variation in change over time. For example, Knight et al. (2009) showed evidence of both mean increases in acculturation, and heterogeneity in change across multiple domains in a sample of Mexican-American juvenile offenders (ages 14-17 at time one) over three years. On the other hand, Matsunaga Hecht, Elek, & Ndiaye (2010) used latent transition analysis to examine profiles and trajectories of ethnic identity and acculturation in a sample of 1,600 Mexican-heritage children (mean age= 10.4; *SD*= 0.60) over a two year period. They found that bicultural orientations were the most prevalent and that the most common pattern over time was maintenance of a particular cultural orientation profile, rather than change. However, there was evidence that some individuals transitioned from one pattern of cultural orientation to another over time. Knight and colleagues (2013) examined

changes in both American and Mexican cultural values over 5 years (three waves of data collection) among Mexican-origin youth in the Southwestern U.S. They found evidence for significant changes in cultural values among three of four trajectory classes. Mexican heritage values decreased in two of four classes (and were non-significant in other two), and American cultural values decreased over time in two of four trajectory classes (and were non-significant in the other two classes). This study was also the only longitudinal study to examine and test quadratic-characterized change in cultural values dimensions, and Knight found evidence for a deceleration in the erosion of American cultural value over time in two trajectory groups. Schwartz and colleagues (2013) examined acculturation and enculturation trajectories among diverse Latino youth (e.g., youth of Cuban, Nicaraguan, Honduran and Columbian heritage, among others) in Miami from seventh to ninth grade (with five waves of data collection). Schwartz and colleagues found evidence for three trajectory classes (i.e., "highly bicultural", "moderately bicultural", and "assimilated"). This study found that acculturation and enculturation demonstrated significant increases over time only among the highly bicultural subgroup of youth, whereas there was no significant change among the other two groups in either acculturation or enculturation dimensions.

The results of these studies suggest that mainstream American and ethnic cultural orientations not only vary within-individuals over time, but that these trajectories also vary across individuals. These studies also suggest that the degree of change may vary depending on developmental stage and other contextual factors, including generation status, age at immigration, frequency of travel to Mexico, ethnic cultural socialization, perceived discrimination. The current study will build on these previous studies by further characterizing acculturation and enculturation trajectories across the transition from childhood to early

adolescence, and linking changes with contextual factors relevant to cultural identity. Compared to growth mixture modeling approaches used by prior studies, the current study will examine specific characteristics of different domains of cultural orientation change using a latent growth modeling approach (e.g., considering English and American cultural values separately rather than trying to specify three profiles with different configurations of English and American values). Although the latent growth modeling approach has the limitation of not being able to simultaneously examine bidimensional cultural orientation, since each cultural dimension is considered separately, its strength is that it can provide greater variability in growth parameters (compared to using trajectory class membership) that may be useful to examine predictive capacity in relation to substance use outcomes. In addition, supplementing growth mixture modeling is important (Mun, Bates & Vaschillo, 2010), because division into discrete trajectory classes has the potential to introduce statistical artifacts (e.g., Bauer & Curran, 2003; Nagin & Tremblay, 2005; Sher, Jackson & Steinley, 2011). At the same time, latent growth modeling methods assumes normality of random effects, which may not be an ideal assumption if growth parameters do indeed cluster into subgroups that may approximate underlying classes. Thus, this study complements prior growth mixture modeling studies by using a latent growth modeling approach while recognizing the possible limitations of both methods.

Culture and Substance Use Risk

Previous cross-sectional research with MO youth has demonstrated that greater endorsement of American/mainstream cultural orientation is related to increased substance use and delinquency (e.g., Fosados et al., 2007; Gonzales et al., 2002; Marsiglia & Waller, 2002; Miller, Miller, Zapata, & Yin, 2008; Samaniego & Gonzales, 1999; Soto et al., 2012) and poor mental health (Escobar & Vega, 2000; Ortega, Rosenheck, Alegria, & Desai, 2000). Other

studies have suggested that greater retention of Latino cultural values and practices, including ethnic affiliation and pride (Marsiglia, Kulis, Hecht, & Sills, 2004), family- and respect-oriented values (Gil, Wagner, & Vega, 2000; Soto et al., 2011), and increased Spanish use and engagement in Hispanic cultural practices (Allen et al., 2008), may be protective against increased substance use, although, other traditional Mexican cultural values such as fatalism may be related to greater substance use risk (Soto et al., 2011). Finally, other studies (e.g., Felix-Ortiz & Newcomb, 1995) have shown that a bicultural orientation (i.e., adopting *both* mainstream and ethnic orientations) may be most beneficial. However, the findings are mixed (e.g., Coatsworth, Maldonado-Molina, Pantin & Szapocznik, 2005) potentially due to a wide range of analysis and measurement methodologies. Many prior studies have utilized a unidimensional conceptualization, or problematically used median-split methodologies to examine bidimensional cultural orientation (see Knight et al., 2013) and few studies have actually examined competing hypotheses about the role of various facets of cultural identity (see Smokowski, Rose, & Bacallo, 2008 for an exception). Thus, it is unclear what combination of mainstream and culture of origin factors is related to the best outcomes for particular cultural groups and community contexts (Schwartz et al., 2010). In general, researchers have speculated that negative substance use outcomes may be related to increased orientation to American culture, decreased orientation to traditional Mexican culture, or a lack of adherence to *both* cultural orientations, however these associations likely depend on family and community characteristics.

Studies attempting to examine the relations between acculturation and enculturation with and substance use are virtually all cross-sectional. These cross-sectional studies allow for the inference of an association, but not the direction of effects between cultural orientation and negative outcomes. In addition, cross-sectional studies, which utilize between individual

differences, are unable to suggest whether the degree of acculturation and enculturation changes (i.e., variability in the processes of acculturation and enculturation) across time may be related to substance use development.

To my knowledge, there is only one previous study that examined direct effects of acculturation and enculturation trajectories in relation to adolescent substance use outcomes. Using the same trajectory classes as Knight et al. (2009), a longitudinal study by Losoya and colleagues (2008) with 300 MO male juvenile offenders found some evidence for the hypothesis that bicultural trajectories (i.e., adolescents remaining high in mainstream and ethnic orientation over time) were related to more positive outcomes with respect to lower binge drinking and marijuana use. Yet, this research has only begun to disentangle the specific cultural trajectories related to increased substance use. There must be additional study of these competing hypotheses within community samples—in the case of longitudinal examination, it is important to tease apart the relations between both acculturation and enculturation changes and the development of early substance use. The current study builds on this previous study by Losoya and colleagues by examining specific effects of cultural orientation domains, using a longer developmental period, modeling direct effects of cultural orientation level and change over time in relation to substance use outcomes using a latent growth modeling framework (thereby utilizing greater variation in growth parameters compared to trajectory class membership), and using modern methods for analyzing count and zero-inflated count data.

Acculturation, Family Context and Substance Use Risk

Theoretically, negative outcomes develop *over time* as an adolescent acculturates to American culture. Acculturation may involve developing a new identity, value and belief system, and behavioral repertoire, and may be related to a simultaneous erosion of traditional values and

beliefs (such as *familismo*) that would otherwise be protective. These process occurs within the context of the family, peer and community, each of which may or may not be at odds with the adolescent's cultural outlook. Theory and past research suggests that acculturation and enculturation processes may be associated with a disruption of family relationships which is then associated with a tendency towards negative outcomes including the association with deviant peers, school problems, delinquency, and substance use (Gonzales, Deardorff, Formoso, Barr, & Barrerra, 2006; Gil, Wagner & Vega, 2000; Prado, Szcapocznik, Maldonado-Molina, Schwartz, & Pantin, 2008; Szcapocznik & Kurtines, 1993; Szapocnik, Prado, Burlew, Williams, & Santisteban, 2007; Vega et al., 1997).

There are multiple lines of evidence supporting the importance of adolescent acculturation and enculturation in family dynamics. First*, adolescent acculturation* in itself may be a risk factor for negative outcomes. The erosion of heritage culture may not only have negative effects on family relationships (Sullivan et al., 2007) but it appears that the erosion of family-related values, attitudes and behaviors, and increased family conflict help to explain the relations between adolescent acculturation and alcohol use (Germán, Gonzales, & Dumka, 2009; Gil, Wagner, and Vega, 2000; McQueen, Getz, & Bray, 2003; Samaniego & Gonzales, 1999). Overall *family level acculturation* may also be important, as MO families that tend to speak or prefer English also tend to report greater family conflict (Gonzales, et al., 2006; Pasch et al., 2006). Decreased parental control appears to be one factor that explains the relation between increased English use in the home and MO youth alcohol use (Mogro-Wilson, 2008).

Differential acculturation. Individuals within the MO family may acculturate to American culture at different rates. Generally, Latino children tend to acculturate faster than their parents (Szapocznik, Scopetta, Kurtines, and Aranalde, 1978), leading to *differential*

acculturation, and creating what have been referred to as acculturation "gaps" (e.g., Martinez, 2006). Differential acculturation is theorized to have multiple negative effects within the family including cultural stress and culturally related conflict, due to an intergenerational clash of values that occurs in differentially acculturating families, and subsequent decreases in protective parenting practices, association with deviant peer groups, and youth maladjustment, including substance use (Kurtines & Szapocznik, 1996; Szcapocznik, Kurtines, & Fernandez, 1980; Vega & Gil, 1998).

Evidence for this theoretical model within MO families is mixed, which may be related to different ways of measuring the acculturation gap (Birman, 2006; Telzer, 2010). Some studies have found no relations between intergenerational differential acculturation and negative outcomes in terms of disrupted family dynamics or child adjustment (Lau et al., 2005; Pasch et al., 2006). Yet overall, there does appear accumulating evidence supporting the negative effects of actual or perceived cultural gaps on family dynamics and in turn, youth adjustment (Marsiglia et al., 2009; Martinez, 2006; Schwartz et al., 2012; Schofield, Kim, Parke & Coltrane, 2008; Smokowski, Rose & Bacallo, 2008, Telzer, 2010, Unger, Ritt-Olsen, Soto, Baezconde-Garbanati, 2009; Unger, Ritt-Olsen, Wagner, Soto, & Baezconde-Garbanati, 2009).

This past research has begun to disentangle the different ways in which youth and familial acculturation and enculturation dynamics may be related to negative outcomes, such as youth substance use, through disrupted family dynamics. Yet again, there is a notable lack of longitudinal research examining this pathway. Emerging longitudinal studies have begun examining pathways linking youth cultural orientation to negative outcomes over time via family mediators (e.g., Updegraff et al., 2012; Lorenzo-Blanco et al., 2013). However, these studies are limited in that they do not examine trajectories of acculturation and enculturation over time,

which continues to discount theoretical underpinnings of cultural orientation development as dynamic change processes that are variably associated with outcomes through differential disruption or maintenance of positive family relationships.

A recent study by Schwartz and colleagues (2013) appears to be the only study that examined links between bidimensional cultural orientation trajectory profiles and substance use outcomes via family dynamics. Their study found that highly bicultural profiles (youth who were increasing in their Americanism and Hispanicism over time) were associated with the most positive family functioning, and authors speculated that biculturalism may be advantageous for adolescents in navigating relationships with their possibly less acculturated parents. Interestingly, the authors found that assimilation (i.e., stable high Americanism and low Hispanicism) profiles were indirectly related to less cigarette smoking and sexual activity via positive family relationships, however further probing indicated that this relationship depended on youth agreeing with their parents regarding positive family functioning characteristics. Further probing suggested that youth who perceived their family relationships to be more positive than their parents had the highest risk of cigarette smoking, sexual activity and unprotected sex. Methodological strengths of that previous study include the use of five waves of data over three years, use of multiple indicators and reporters (i.e., parents and children) of family characteristics, and tests of mediation with appropriate temporal ordering. Notably, their study utilized growth mixture modeling, which assumes that cultural orientation change parameters can be discretely divided into trajectory subgroups. Assuming that growth curve parameters follow a normal distribution, applying latent growth curve modeling methods may be able to utilize greater variation in growth parameters to predict outcomes of interest. In addition, this prior study used a sample of Latino youth in Miami from diverse national backgrounds (e.g., Cuban,

Nicaraguan, Honduras) with a majority of both parents and adolescents being foreign-born. Additional investigation is warranted to examine within-group variation among Mexican-origin youth, and focus on a novel community environment in Northern California may provide additional information regarding appropriate generalization of these processes to varying cultural and community contexts across the U.S. Latino population.

Overview of the Dissertation Study: Aims and Hypotheses

The current study applies an ecodevelopmental perspective to understanding the intersection between potential changes in cultural identity, family processes, and substance use risk over time using secondary data from a longitudinal community sample of Mexican-origin youth and families living in Northern California. This study seeks to inform the literature on cultural risk and protective factors that is convoluted by a number of theoretical, measurement and methodological issues. The current study will connect longstanding theory linking developmental risks of cultural change with negative outcomes via family dynamics by testing longitudinal mediation models in a latent growth modeling framework using multiple indicators of family relationships and multiple indicators of substance use outcomes. This study addresses previous methodological and theoretical issues by using an appropriate longitudinal design, measuring multiple cultural domains in theoretically meaningful way, examining a ethnically homogenous group of Mexican-origin youth, and by providing novel ways to test longstanding theoretical questions using latent growth curve modeling, categorical and count data outcomes, and tests of mediation. The long term-goal of the current study is to limit adolescent substance use initiation and problematic use by informing the development of culturally competent prevention and intervention efforts for Mexican-origin youth. Following are the specific aims of the current study:

Specific Aim #1: Analyze stability and change in domains of youth acculturation and enculturation over time within developmental and environmental context.

Building on several previous studies (e.g., Knight et al. 2009; Matsunaga et al., 2010; Knight et al., 2013; Schwartz et al., 2013), I will examine changes in youth acculturation and enculturation domains over five years, from age 10 to age 15 (grade 5 – 9). I will examine changes across multiple dimensions of acculturation and enculturation, based on the overarching theoretical framework of Schwartz and colleagues (2010), including cultural values, practices, and identity (Unger & Schwartz, 2012). I will separately examine change characteristics of English use and American cultural values (acculturation domains), and Spanish use, Mexican cultural values, traditional family values, and Mexican-American ethnic pride (enculturation domains) to carefully attend to unique change characteristics of various cultural domains.

I use latent growth curve modeling approach to attempt to characterize average growth curves and variation in growth curves, and test theoretically-interesting growth parameters including associations between initial levels (intercept) and change (slope), and quadratic-characterized change. Consistent with an ecodevelopmental approach, I will also examine whether cultural trajectories may differ for boys and girls, and examine the predictive capacity of multiple contextual factors that may influence degree and direction of change, including family income, mother education, and child perceived discrimination. Results will be considered within a developmental framework (Fuligni, 2001; Sam, 2006b).

Hypothesis 1a: On average, youth acculturation (i.e., American cultural identity) levels will increase over time; on the other hand, average youth enculturation (i.e., Mexican cultural identity) will decrease over time. For both cultural identity orientations, initial levels and the degree of change will vary across individuals and across dimensions. I hypothesize that boys and

girls will have different cultural trajectory characteristics, however, since this specific question is exploratory I do not suggest any *a priori* expectations.

Hypothesis 1b: Initial levels and change over time in cultural orientation domains will be related to childhood (age 10) demographic factors including family income, mother education, and perceived discrimination. The degree of American identity change will be influenced by income, and perceived discrimination.

Specific Aim #2: Test longitudinal relations between bidimensional changes in cultural orientation and substance use intentions and behavior.

The current study examines links between cultural orientation change characteristics (i.e., level and change over time) with age 15 substance use risk indicators, including substance use intentions, which are an important predictor of eventual substance use (Andrews, Tildesley, Hops, Duncan & Severson, 2003). I also examine potential concurrent changes in cultural identity domains and substance use intentions across ages 10 - 15. These analyses will inform significant gaps in the literature on cultural risk and protective factors for substance use that have discounted developmental (i.e., within-individual) changes over time. I use advanced methodological techniques including latent growth modeling and parallel process growth modeling approach to examine bidirectional changes in substance use and culture, examine the potential predictive capacity of initial level as well as slope of acculturation change in relation to substance use outcomes.

Hypothesis 2: Higher levels of acculturation and lower levels of enculturation at age 15 will be related to increased substance use and intentions, given previous research that suggests that the respective cross-sectional risk and protective effects (e.g., Allen et al., 2008; Gil, Wagner, & Vega, 2000; Gonzales et al., 2002) of these aspects of identity. Moreover, increases

in youth acculturation and decreases in youth enculturation will be associated with higher substance use risk.

Specific Aim #3: Examine whether changes in family relationships account for relationship between changes in family acculturation dynamics and youth substance use.

I examine the potential mediating role of negative family dynamics in the link between cultural change processes and substance use development. Specifically, I examine the indirect effects of youth acculturation/enculturation *initial levels* and *change over time* on substance use risk via family relationship dynamics.

For these analyses, I focus on language use (Spanish and English), overall American values (materialism, competition, and independence), traditional family values, and Mexican-American ethnic pride. I also separately examine multiple indices of family functioning and the parent child relationship, including parent warmth, parent-child conflict and family cultural conflict as potential mediators given previous research and theory that implicates general family conflict, family cultural conflict, and quality of the parent-child relationship as explanatory mechanisms (e.g., Gil, Wagner, & Vega, 2000; Gonzales et al., 2006; Marsiglia, Parsai, & Kulis, 2009; McQueen, Getz, & Bray, 2003; Samaniego & Gonzales, 1999; Smokowski, Rose, & Bacallo, 2008).

Hypothesis 3: Disrupted family dynamics (including increased family conflict, less warm family relationships, and the presence of family cultural conflict) will mediate the association between *adolescent cultural changes* (especially decreases in familism, Mexican ethnic pride, and Spanish use, as well as increases in English use and American cultural values) and later substance use.

Public Health/Clinical Significance

The current project examines the development of substance use risk among Mexican-origin youth, a group in which substance use is disparately high, and this dissertation represents a unique opportunity to address the disparity in early risk behaviors for this group. Numerous intervention and prevention programs have been developed that specifically target substance use, or target the matrix of risk factors that are associated with substance use, at various developmental stages (for reviews see Faggiano et al., 2008; Kumpfer, Alvarado & Whiteside, 2003; Spoth, Greenber, & Turrisi, 2008). Yet, there are few culturally relevant prevention and intervention programs that target Latino youth substance use and its precursors (Martinez, Eddy, & DeGarmo, 2003). Most prevention programs are "generic" programs, heavily influenced by White middle class values (Kumpfer, Alvarado, Smith, & Bellamy, 2002; Resnicow, Soler, Braithwaite, Ahluwalia & Butler, 2000). In the few instances of interventions that place particular emphasis on Latino adolescents and their families, such as Brief Strategic Family Therapy (Santisteban et al., 2003; Szapocznik & Williams, 2000) and *Familias Unidas* (Coatsworth, Pantin, & Szapocznik, 2002), the research underlying these programs is hampered by the shortage of longitudinal research on the intersection of individual, familial and cultural processes as it relates to substance use etiology. These are areas where further investigation is necessary to improve access, engagement, and retention of Latino youth in the development of effective and culturally salient prevention and treatment programs.

I seek to increase the understanding of the acculturation process as a risk pathway for substance use, and to examine disruptions in the family environment as a potential mechanism explaining links between cultural orientation levels and change with substance use risk, which will enable the tailoring of psychosocial prevention and intervention efforts for adolescents and

families of Mexican heritage. The family environment is a particularly salient intervention target in Latino families (Coatsworth, Pantin, & Szapocznik, 2002; Santisteban et al., 2003; Szapocznik & Williams, 2000), and this project aims to provide knowledge designed to increase the effectiveness of interventions aimed at supporting optimal family functioning.

Chapter 2: Method

Study Design

This study uses secondary data from a longitudinal community cohort study funded by the National Institute on Drug Abuse (DA017902; Rand D. Conger, PI), which examines the development of alcohol, tobacco, and other drug use in Mexican-origin youth. For participant recruitment, children and their families were drawn randomly from rosters of students in two school districts in a large metropolitan area in Northern California. First-, second-, and third-generation children of Mexican-origin living with their biological mother were eligible for the study. Participants were recruited by telephone or, in cases where they did not have a telephone, by a recruiter who went to their home. Out of the eligible families, 72.2% agreed to participate. Trained research staff interviewed the participants in their homes using laptop computers equipped with audio computer-assisted self-interviewing (ACASI). They visited the families on two separate occasions within a one-week period. Visits lasted approximately three hours during which each participant was interviewed separately by one of two interviewers. Families were interviewed approximately yearly during 2006–2012. Families were compensated for their participation; parents each received $75, and children $50 total for two visits. Interviews were conducted in Spanish or English based on participant preference. The original study administered a battery of measures at each wave assessing child, parent, and family characteristics using

questionnaires as well as observational ratings of family characteristics during family-based tasks. Using five waves of secondary data (collected approximately yearly) from this longitudinal community cohort study, I conducted a novel series of studies to disentangle substance use risk and resilience related to cultural and family relationship changes over time.

Sample

There were 674 Mexican origin families in the sample at Wave 1. The CFP dataset is made up of a sample of families in which the majority of parents are immigrants, while the majority of children were born in the United States. Families had a median income below $35,000 and most mothers did not finish high school. Sample characteristics are listed in Table 1.

Measures

Language Use. I used the Acculturation Rating Scale for Mexican-Americans–II (ARSMA–II; Cuellar, Arnold, & Maldonado, 1995) to assess *English* use (5 items) and *Spanish* use (5 items). Items asked participants to report how frequently they spoke, wrote, thought, listened to music, and watched television in each language, using a four-point frequency scale (1= *Never or almost never*, 4= *Always or almost always*). Although the original ARSMA-II also measures ethnic identity and affiliation, the current study only used language use items for both subscales. See Table 4 for descriptives and Cronbach's alphas across study waves.

Cultural Values. We used the Mexican American Cultural Values Scale (Knight et al., 2010) to assess American Cultural Values (ACV) (14 items) and Mexican Cultural Values (MCV) (36 items). These two dimensions were supported as higher order factors in a validation study that used data from three independent research projects. The items comprising this measure were developed through focus groups of immigrant and U.S. born Mexican-origin individuals, including adolescent and adult males and females that were asked to identify traditional values

that they ascribed to both Mexican and American culture. The ACV scale measures values related to self-reliance, material satisfaction, competition, and independence, whereas the MCV scale measures traditional values including gender-role attitudes, religion, respect, and three forms of familism: support, obligations, and family as referent. The MACVS uses a four-point rating scale indicating endorsement of cultural values (1= *Not at all*, 4= *Very much*). Although both MCV and ACV are composite scores of multiple subscales, Knight and colleagues (2010) indicated that the stability of individual subscales varied and recommended using the overall means. At the same time, Knight et al., also suggested that researchers may combine the three forms of familism (i.e., support, obligations, and family as referent) for an overall measure of traditional family values. Thus, to measure traditional cultural values I used both the overall MCV subscale and the more specific traditional family values subscale (these were correlated at $r = .91$ across Waves 1 - 5).

Mexican-American Ethnic Pride. I also used a 9-item scale measuring Mexican-American *ethnic pride* adapted from two sources (Phinney, 1992; Thayer et al. 2002). This scale assessed youth's positive feelings about their ethnic background, with items such as "You have a lot of pride in your Mexican roots," "You like people to know that your family is Mexican/Mexican-American," and "You feel a strong attachment towards your own ethnic group."

Family Dynamics. For the current study, I used wave three data assessing child report of family relationship characteristics, focusing on parent-adolescent conflict, parental warmth and hostility, and family cultural conflict. *Parent-Adolescent Conflict* was assessed using an 8-item measure developed by Gonzales and colleagues (2004), which measured perceived degree of conflict with mother and father (each parent rated separately) over the previous three months

(e.g., “How often have you and your mom disagreed with each other?” “You and your mom became very frustrated with each other,” and “You and your mom yelled or raised your voices at each other.”). The measure was rated on a four-point frequency scale (1= *almost never or never*, 2 = *sometimes*, 3= *a lot of the time*, 4= *almost always or always*). The child rated parent warmth for mother and father (10 items; $\alpha = 0.82$) separately, using the Behavioral Affect Rating Scale (BARS)(Kim et al., 2003). Children reported how often their parent engaged in specific actions over the previous three months, such as expressing care and actively supporting the child (e.g., “how often did your father listen carefully to your point of view,” “act supportive and understanding toward you”). The warmth measure utilized a four-point frequency rating scale. Family cultural conflict was measured by five dichotomous items from the Multicultural Events Scale for Adolescents (MESA; Gonzales, Gunnoe, Jackson, & Samaniego, 1996), which broadly assesses the frequency of minor disagreements and more serious arguments within the family. These items specifically examine cultural conflict (rather than more general conflict) during the past three months (e.g., “a family member got upset at you for not participating in the family's cultural or religious traditions,” and “ people in your family accused you of not being proud of your Mexican background”). Items were summed to form a count indicator of family cultural conflict, and then coded into a binary variable (0 = no family cultural conflict, 1 = any family cultural conflict) due to sparseness of family cultural conflict events.

Substance Use. To assess substance use risk, I used a measure of Children’s *substance use intentions* (SUI)(Gibbons et al., 2004), which examined intentions to use alcohol, tobacco, and other drug use (three items for each class for a total of nine items; $\alpha = .91$). For each substance, children reported the degree to which they were planning on using (0 = *do not plan to*, 1 = *probably won't*, 2 = *probably will*, 3 = *do plan to*), the likelihood of using each substance (0

= *definitely will not*, 1 = *probably will not*, 2 = *probably will*, 3 = *definitely will*), as well as how willing they would be to use the substance if their friends were using (0 = *not at all willing*, 1 = *kind of willing*, 2 = *very willing*). These items were summed to form a count variable that reflected overall degree of SUI. I also created a dichotomous variable that reflected the presence or absence of any SUI. For this dichotomous variable, any scores above zero were considered to reflect some degree of SUI. Children's substance use behaviors were assessed for alcohol and cannabis use, given that these two classes of substances had the highest prevalence of use at the final wave (Wave 5). First, I created a measure of past three month alcohol use intensity at age fifteen, which reflected the frequency (0 = *Never*, 1 = *Less than once per week*, 2 = About once per week, 3 = *Two to three times per week*, 4 = *(Almost) every day*) x variety (i.e., beer, wine and liquor) of alcohol use (e.g., "In the past 3 months, how many times have you used or tried beer - more than just a few sips?"). This variable was treated as a count outcome as detailed below. I then created a dichotomous variable to reflect presence versus absence of alcohol use during the past three months (0 = *no use*, 1 = *any use*). Using a measure of past three month cannabis use frequency ("In the past 3 months, how many times have you used or tried marijuana?"), I created a dichotomous measure of cannabis use (0 = no use, 1 = any use) given the low frequency of use.

Covariates. Child gender was tested as a moderator (see Aim 1), and in later aims tested as a covariate (see Aims 2 and 3). Other covariates that were included in the current study included child gender, mother education, family income, and child perceived discrimination. Specifically, child perceived discrimination was assessed using a set of items developed in prior unpublished work (Johnston & Delgado, 2004), and previously adapted from measures examining discrimination experiences among adults (Hughes & Dodge, 1997; Klonoff & Ladrine, 1995). From a set of 18 items, a three-item and a five-item scale were supported based

on exploratory factor analyses conducted by the CFP study team (see Table 2 for items). These items were rated on a four-point Likert scale (1 = *Not at all true*, 2 = *Somewhat true*, 3 = *Mostly true*, 4 = *Very true*) or four-point frequency scale (1 = *Almost never or never*, 2 = *Sometimes*, 3 = *A lot of the time*, 4 = *Almost always or always*). The first dimension was characterized only by discrimination perpetrated by peers at school, termed *peer discrimination*, while the second dimension was characterized by discrimination perpetrated by teachers and peers at school, which I labeled *combined discrimination*. Child generational status was tested as a covariate in Aim 1 only. I used dummy coding to examine potential differences in growth parameters between 1st and 2nd generation youth (1st generation = 0, 2nd generation = 1, 3rd generation = 0), and between 1st generation and 3rd generation youth (1st generation = 0, 2nd generation = 0, 3rd generation = 1), where 1st generation youth were the reference group.

Analytic Plan

Analyses were conducted in SPSS version 21.0 (IBM Corp., 2012), Mplus version 7.11 (Muthén & Muthén, 2013), and in R studio version 0.98.501 (RStudio, 2013) using R version 3.0.3 (R Core Team, 2014). Before testing the study hypotheses, preliminary analyses included obtaining descriptive statistics and zero-order correlations among study variables separately for each wave. Plots and figures were constructed in Microsoft Excel, PowerPoint, Mplus and R Studio.

Missing data.

Full Information Maximum Likelihood (FIML) was used to estimate model parameters for all LGMs, assuming ignorable missingness at random. FIML is preferable to listwise deletion as it considers all available raw data, and provides less biased parameter estimates compared to listwise deletion, mean imputation and other *ad hoc* missing data techniques (Enders, 2001;

Wothke, 2000). Although FIML is available in Mplus, it is not currently available in for *nlme* in R.

Addressing time: Age & spacing of measures.

CFP researchers originally intended to collect measures once at each grade at an annual or biannual interval. Due to data collection procedures, two issues were evident in terms of addressing the analytic plan. First, because focal child participants were recruited according to being enrolled in grade 5 at baseline, there was variation in age at each time point (e.g., age 9 – 12 at Wave 1). In addition, due to typical issues that arise in a longitudinal study related to participant follow-up, measures were not always administered exactly annually or biannually, resulting in a distribution of intervals in between data points (see Figure 1), and sometimes multiple time points within the same age (e.g., two measures at age 12-one at 12 and 2 months, another at 12 and 11 months). This led to two different plans for considering time within models.

First, I first sorted waves into age bands with one measurement per year. Age sorting relied on rounding age at each time point to the nearest whole number. The few children with precise ages below 10 (e.g., nine years and ten months) were rounded up to 10, and ages above 15 were rounded down to 15. In cases where there was more than one measurement per age (e.g., two measures at age 13, for example one at age thirteen and two months and the second at age thirteen and nine months), I manually sorted to round age up or down based on what other time points were present for the participant. This resulted in a recoded age marker (assigned to each measure since the data were in wide format for SEM-based analyses), that was a whole number between 10-15. This method is appropriate given that primary aim 1 and 2 questions focused on developmental changes by age rather than measurement occasion (i.e., wave), and age sorting longitudinal data has been used in prior studies (e.g., Knight et al., 2009). This method was also

particularly important due to the analysis objectives in Aim 1 (testing gender as a moderator of LGM parameters), Aim 2 (using growth parameters to predict substance use outcomes, including in parallel process growth models).

Second, as is most ideal in studies with a research design involving unbalanced time (i.e., participants are all measured at different times with different intervals between measures), I examined Aim 1 models using age as a random effect to verify that SEM growth curve parameters were not biased by age sorting procedure. This was done in a multilevel framework (with a "long" data format) using the *nlme* package (Pinhero, Bates, DebRoy, Sarkar, & the R Development Core Team, 2013) in R. I compared models fit and parameter estimates across the multilevel and SEM frameworks to identify any discrepancies. In general, I relied on SEM-based models given their flexibility in examining structural (i.e., regression) pathways as in parallel process LGMs, and models predicting substance use outcomes from LGM parameters as in Aims 2 and 3. For the base models (i.e., unconstrained LGMs) only (since the multilevel models were intended to be a check on Aim 1 base models), I report differences between the two methods to the degree that any were found across the approaches to handling time.

In Aim 3, I reverted back to using the data sorted by wave due to the degree of missing data using that approach, particularly for the mediator and outcome variables, which created issues for model estimation in Mplus.

Moderation analyses.

Moderation analyses were implemented in Aim 1 to examine how the characteristics of cultural change (e.g., initial level and slope) differed by gender. Thus I tested for moderation by gender using multi-group SEM procedures and included it as a moderator in Aim 1 models when

indicated by chi-square (χ^2) deviance tests. For Aim 1 and 2 I included gender in models as a covariate since this was out of the current scope of this study.

Estimator.

Maximum Likelihood (ML) estimation methods are used across software packages and analyses. ML estimation is an iterative procedure (using an algorithm such as expectation maximization (EM)), which identifies a set of parameter estimates that maximize the likelihood function in describing the distribution of all available observed data (Dempster, Laird & Rubin, 1977; Little & Rubin, 2002). ML is particularly appropriate for data that include missing values (Dempster, Laird & Rubin, 1977; Hartley, 1958; Schafer & Graham, 2002). In Aim 1 I used traditional ML approach in order to obtain SEM fit statistics for LGM, which were useful for nested model comparisons[1]. In Aim 2 I utilized maximum likelihood estimation with robust standard errors (MLR) since traditional SEM fit statistics were less important in these models. In Aim 3 I reverted back to the traditional ML approach in order to generate bootstrapped resamples.

Assessing model fit.

In Aim 1, and continuous models in Aim 2 and 3, model fit was assessed using Chi-Square as an indicator of exact fit. Where exact fit was not achieved (as chi-square is sensitive to violations of normality and sample size, Hu & Bentler, 1999), I used several common relative fit indices that are transformations of chi-square. Specifically, I used the Tucker-Lewis Index (TLI), comparative fit index (CFI), root-mean square error of approximation (RMSEA), and

[1] Although MLR worked well for English and Spanish use variables and provided traditional SEM fit statistics (including robust chi-square), MLR did not provide those fit statistics for other cultural variables due to sparse coverage across adjacent ages. Reverting to ML did not change any substantive estimates or model selection decisions, thus ML models were retained for all cultural variables.

standardized root mean square residual (SRMR) to supplement Chi-Square based on the guidelines provided by Hu and Bentler (1999) and the cautions of Marsh, Hau & Wen (2004). These model fit indices are all appropriate for SEM-based LGMs (Wu, West, & Taylor, 2004). In Aim 2 and 3 models in which these fit statistics were unavailable (e.g., models with count outcomes), AIC and BIC and the likelihood ratio were used to assess model fit.

Categorical and count data outcomes.

Aims 2 and 3 focused on examining child substance use risk outcomes, which are typically infrequently endorsed in community samples of youth. I utilized generalized linear modeling (GLM) techniques to more appropriately model the distributional characteristics for categorical and count-type data. Count outcomes for substance use are discrete integer data that have a lower bound of zero and are generally positively skewed. Although substance use intentions and alcohol use intensity are not true count outcomes, they were followed a count-type distribution in that they were highly skewed and had a high proportion of zeros. Figures 2 and 3 show the distribution of SUI across ages 10 - 15 and age 15 alcohol use intensity respectively. Thus, I proceeded in testing models in which I specified age 15 substance use intentions and alcohol use intensity as a pseudo-count, and relied on model testing to empirically test which distributional assumptions (e.g., Gaussian vs. Poisson) best fit the underlying observations for substance use outcomes. The GLM method for analyzing categorical outcomes (i.e., any SUI, any alcohol use, any cannabis use) (see Figure 4) specified a binomial distribution using a logit link function. Regression estimates were exponentiated to derive the odds ratio, which link a one-unit change in the predictor with a change in the odds of having any substance use intentions or cannabis use (Atkins & Gallop, 2007).

In model fitting for my pseudo-count data I relied on count and zero-inflated count methods. The broader class of probability distribution models for count data include the Poisson distribution model, and the Negative Binomial (NB) distribution model, an extension of the Poisson that allows for the variance to be estimated as an additional free parameter in the model instead of being fixed (to be equal to the mean) as in Poisson, and accounts for "over-dispersion" (i.e., the variance of distribution > mean of distribution). The second class of models are zero-inflated probability distribution models, which better account for the high proportion of zeros often observed in data examining substance use/intentions variables. These approaches include the zero-inflated Poisson (ZIP), and zero-inflated Negative Binomial (ZINB) models. Like the Poisson and NB models, the ZIP and ZINB models are equivalent except in that the ZINB estimates a variance parameter, while the variance parameter is fixed in the ZIP model. In comparison to the ZIP and ZIP "mixture" models, in which the count portion of the model includes a mixture of values above zero as well as certain proportion of zeros, zero-inflated hurdle models (both Poisson and Negative Binomial) partition the zero portion of the data and the count part of the data into separate models for estimation (Atkins & Gallop, 2007).

Zero-inflated regressions test two models, that is, whether covariates predict the *degree* of use/intentions (i.e., count portion) and *likelihood* of having none versus any (i.e., logistic portion) use/intentions, with each model using different methods to handle zeros (Long, 1997; Hilbe, 2011). In this approach, predictors are connected to the count portion via a natural logarithmic link function assuming a Poisson distribution, and to the logistic portion via a logit link function assuming a binomial distribution (Atkins & Gallop, 2007; Cameron & Trivedi, 1998; Hilbe, 2011). Final regression estimates were exponentiated (the inverse link function), which allowed for easier interpretation. For the count model, exponentiated coefficients are

interpreted as a rate ratio (*RR*), or the percentage change in the expected counts for each unit increase in the predictor; for the logistic model exponentiated coefficients utilize an odd-ratio interpretation, and can also be interpreted in terms of probability (Atkins & Gallop, 2007). For ease of interpretation, I calculated *RRs* and *ORs* in standard deviation (*SD*) units for the predictor variable. In Aim 2, I conducted model comparisons using AIC and BIC as model fit indices to determine which probability distribution model best fit the data, before running the main regression analyses linking cultural growth parameters with substance use outcomes.

Testing mediation.

I tested mediation using two methods within a latent growth curve modeling framework (Selig & Preacher, 2009). First, for the continuous SUI variable and the dichotomous alcohol and cannabis use measures, I tested mediation according to Shrout and Bolger (2002) and supported by MacKinnon (i.e., MacKinnon, Lockwood and Williams, 2004; MacKinnon et al., 2002), in which I used bias-corrected bootstrapped resampling methods with 1000 bootstrapped samples to obtain estimates of the indirect effect (i.e., the product of *a* x *b*) and the 95% confidence interval. If the 95% asymmetric confidence intervals (CI) of *a* * *b* (i.e., 950 of 1000 bootstrapped runs) did not include 0 there was evidence of a significant mediated effect (MacKinnon, 2008; MacKinnon et al., 2002; MacKinnon & Lockwood, 2010). For the ZIP outcome variables, I ran models using Monte Carlo integration with 1000 integration points. Indirect effects were calculated using the product of coefficients approach via the *model constraint* command in Mplus, and confidence intervals for the mediated effect were calculated using the Rmediation package (Tofighi & MacKinnon, 2011) in Rstudio. Note that in the dissertation I only present results for the continuous measure of SUI, and dichotomous outcomes for any alcohol or cannabis use; count outcome models are not included due to space limitations.

Aim 1: Acculturation and enculturation change.

The first aim of the current study was to test whether and how acculturation levels change over time, and to predict change in cultural orientation over time from baseline characteristics. This aim was tested using LGM within a structural equation modeling (SEM) framework (e.g., Bollen & Curran, 2006; Curran and Hussong, 2003; Duncan, Duncan, & Strycker, 2006; Ferrer, Hagamami & McArdle, 2004; Meredith & Tisak, 1990; Preacher, Wichman, MacCallum, & Briggs, 2008). First, I tested univariate unconditional LGMs of acculturation and enculturation modeling levels of cultural orientation at age 10 and the linear rate of change from age 10 to 15. For this series of models, the intercept factor loadings were fixed to 1, and the linear slope factor loadings were fixed to 0 (age 10), 1 (age 11), 2 (age 12), 3 (age 13), 4 (age 14), and 5 (age 15) (see Figure 5). As indicated by the factor loading specifications, the intercept was set to age 10 for all models. The residual variances of the indicator at each age were allowed to vary from each other in each model. In these models, a significant intercept indicated that the initial level of cultural orientation at age 10 is significantly different from zero, while a significant slope indicated that cultural orientation, on average, changed over time. Latent growth modeling also provided a test of between individual differences in initial levels and change over time (see Figure 6 for random sample of five participants illustrating variation in raw observations over time). Significant (i.e. non-zero) variances for the intercept and slope indicated between-individual differences in the initial level and rate of change, respectively. Significant correlations between intercept and slope, which were allowed to covary in all univariate latent growth models, indicated that initial levels were related to degree of change. I also tested a series of quadratic models that added a fixed quadratic term to assess whether average cultural change was best characterized by a quadratic trend (see Figure 7). In these models I probed the quadratic

effects by manipulating the intercept across age, using age 10, age 13 and age 15. This allowed me to probe the model to test for acceleration and deceleration using the linear slope term, which represents the instantaneous growth rate at each time point (Grimm, Ram & Hagamami, 2011). I tested the same series of models using random effects models in R studio version 3.0.2 using the *nlme* package (Pinhero, Bates, DebRoy, Sarkar, & the R Development Core Team, 2013) where exact age (at each wave) is used as a random variable; since results from SEM and multilevel models are often equivalent (e.g., Curran, 2003), replication was designed to ensure that age sorting did not have undue influence on model parameters or fit.

Next, I also tested moderation by gender of LGM parameters (intercept, slope and quadratic factor means, variances, and covariance between intercept and linear slope) using multi-group procedures in Mplus. For nested model tests, hypothesized improvement in model fit was evaluated by examining $\Delta\chi^2$ (i.e., chi-square difference tests).

As a secondary aim, I also examined conditional models using demographic and contextual factors at grade 5 (i.e., Wave 1) to predict variability in cultural orientation initial levels and change (see Figure 8), including child gender, generational status, and mother education and family income as covariates, as these are important contextual influences on acculturation dynamics (e.g., Knight et al., 2009; Matsunaga et al., 2010; Portes & Rumbaut, 2001). In addition, I also entered two child dimensions perceived discrimination as covariates of intercept and slope. Although I originally proposed testing child contact with Mexico as a covariate, there degree of missingness (> 90%) precluded examining this variable.

Aim 2: Predicting substance use and intentions.

The second aim was to examine whether acculturation and enculturation level and changes predicted both substance use intentions, a risk factor for substance use, and actual

substance use behavior. In Aim 2 models, I continued using the data organized by age to attempt to capture cultural change and substance use risk in developmental context. In all Aim 2 models I specified the intercept of the cultural LGMs to age 15, rather than age 10 as in Aim 1 models, due to computation errors arising when estimating models with intercept at age 10. Specifically, the intercept factor loadings were fixed to 1, and the linear slope factor loadings were fixed to -5 (age 10), -4 (age 11), -3 (age 12), -2 (age 13), -1 (age 14), and 0 (age 15). I first examined a series of LGM models testing whether cultural orientation level and change predicted substance use intentions (SUI) at age 15 (designed as a first step given the low prevalence at earlier ages), specifying SUI as a continuous variable. To test an alternative distributional assumption for SUI, I then specified these models as zero-inflated counts, which provided a test of whether cultural orientation level and change were related both to the degree of SUI (count portion) and also the presence versus absence of SUI (logistic portion) (see Figure 9). I next tested a series of six parallel process growth models (PPGM; Cheong, MacKinnon, & Khoo, 2003), which tested the associations between the intercepts and slopes of dimensions of cultural orientation and a dichotomized SUI (0 = no SUI, 1 = any SUI) variable across ages 10-15.

Because the prevalence of substance use intentions were highest at age 15, I modeled substance use and intentions with the intercept fixed to age 15, modeling change in use and intentions from age 10 to age 15 and level of use and intentions at age 15. These models tested how level and changes in cultural orientation predicted likelihood of any SUI at age 15 (controlling for changes in likelihood over time) and changes in the likelihood of SUI from age 10 to age 15 (controlling for likelihood at age 15) (see Figure 10). These analyses addressed whether cultural changes may be related to increasing risk of substance use across development. I next tested how level and change of cultural orientation dimensions predicted alcohol use

intensity (variety x frequency) at age 15. Given the skewed and zero-inflated characteristics of alcohol use intensity, I tested a series of different count model specifications, and ran the final models testing whether level and change of alcohol use intensity were related to the degree (count portion) and presence versus absence of alcohol use (logistic portion). Given the low frequency of alcohol use, I also supplemented zero-inflated models by collapsing age 15 past three month alcohol use into a dichotomous variable reflecting any versus no alcohol use (0 = no use, 1= any use), and tested a series of models testing whether level and change in cultural orientation was related to presence versus absence of alcohol use. Finally, I also examined age 15 past three-month cannabis use as a dichotomous outcome variable (0 = no use, 1 = any use), similarly testing the associations between level and change in cultural orientation as related to presence versus absence of cannabis use. My model building procedures first examined models with covariates and substance use outcomes alone, and then added in cultural LGMs. I ran Aim two analyses in Mplus 7 within a SEM framework using Maximum Likelihood with robust standard errors estimation. I used AIC and BIC values to compare the fit of zero-inflated models (i.e., ZIP, ZINB, and ZIH) along with modeling the variable as a continuous outcome.

Aim 3. Investigating the mediating role of family context.

The third aim was to examine family context, as assessed using various indicators of family dynamics (conflict, warmth, and a specific measure of family cultural conflict), as a mediator of the associations between cultural orientation level and change as related to substance use and intentions. Using the data organized by wave, I first tested univariate LGMs for cultural variables to ensure that there was significant variation in slope and intercept in these models. I then built up to the full mediation models in which I examined the indirect effects of the initial levels (intercept) and change (slope) in cultural orientation from Wave 1 to Wave 5 on the level

of substance use and intentions at Wave 5 via characteristics of family relationships at Wave 5 (controlling for Wave 1 family dynamics) (see Figures 11 and 12). In terms of cultural predictors, I dropped the Mexican cultural values (MCV) variable as a predictor given its overlap with traditional family values, leaving five cultural predictors (English and Spanish use, American cultural values, traditional family values, and Mexican-American ethnic pride). For two mediators, I created composite latent factors to model common variation within child's report of warmth (rating mother and father) and parent-child conflict (rating mother and father). Family cultural conflict was treated as an observed variable, and due to distribution characteristics of original count variable, I modeled this as a dichotomous family cultural conflict measure (0 = no family conflict, 1 = any family conflict). I utilized five different substance use outcomes also used in Aim 2, including SUI specified as a continuous variable, SUI specified as a zero-inflated count, alcohol use intensity specified as a zero-inflated count, any alcohol use (binary), and any cannabis use (binary). I then tested mediation according to the two methods described above.

Overall, I tested a combination of 5 predictor variables (i.e., cultural variable LGMs) x 3 mediators (latent factors for conflict and warmth, and family cultural conflict binary variable) x 5 outcome variables, resulting in a total of 65 final models. Given this large number of final Aim 3 models, I present only a subset of the models in this dissertation including the continuous SUI outcome, any past three month alcohol use, and any cannabis use.

Chapter 3: Results

Descriptive Statistics

Means, standard deviations and ranges for study variables are presented in Table 3 (cultural variables by age), Table 4 (cultural variables by wave), and Table 5 (family relationship

variables by age). Distributions of cultural variables are presented in Figures 13 – 18 are also provided in box-and-whisker plots to further illustrate variation in scores. Zero-order correlations for cultural variables by wave are presented in Table 6 (and further illustrated with a correlation heat map in Figure 19), and family relationship correlations at Waves 1 and 5 are presented in Table 7.

Aim 1: Characterizing and Predicting Cultural Orientation Change

Results for univariate linear LGMs are presented in Table 8, and results for LGM quadratic models are presented in Table 10.

Acculturation domains.

English use. The unconstrained LGM for English use demonstrated that youth's average level of English use at age 10 was 3.30 (with a scale maximum of 4), and youth increased by an average of 0.66 standard deviations (*SD*) from age 10 to age 15 (see Figure 20) at a rate of .05 unstandardized units per year. Youth varied in their initial age 10 English use levels with approximately 68% (i.e., ± 1*SD*) of youth with scores between 2.88 and 3.72 (λ = intercept variance term = 0.17, $p < .001$), and there was also variation in degree of change for youth English use (λ = slope variance term = 0.008, $p < .001$). I interpreted slope variation in the context of a notable association between intercept and slope of $\beta = -0.64$; this standardized estimate can be likened to a correlation coefficient between the intercept and slope factors. To probe the relation between intercept and slope I plotted the intercept at low (-1*SD*), medium (mean), and high (+1*SD*) values, along with predicted values according to low, medium, and high slope values as calculated using the correlation between intercept and slope (see Figure 21). These findings indicated that while on average youth changed over half (.66) of a standard deviation, youth who started out with lower English use had a steeper change (+1.38 *SD* gain

from age 10 to 15) in English use, while youth already high in English use at age 10 were relatively steady (-0.05 *SD* decrease from age 10 to 15) in their English use over time. I next added a fixed quadratic slope term to the model (the model had estimation problems when a random quadratic slope was included), and a chi-square deviance test suggested that this did not substantially improve model fit (χ^2_{dif} (df = 1) = 2.86, p >.05), so the SEM-based model implied that the quadratic effect should be dropped (however, see multilevel model section for replication difference).

Gender moderation. I next tested whether growth parameters differed by gender by using a multi-group LGM and specifying males and females as different groups. I used an iterative procedure working from a fully fixed (gender equivalent) model where fixed and random intercepts and slopes (and their covariance term) were specified as equivalent across genders. I sequentially relaxed equality constraints, comparing changes in model fit using chi-square deviance tests (all comparisons were one degree of freedom tests). I found that model fit did not improve when I relaxed equality constraints (see Table 12). In short, there were no differences between boys and girls in the growth parameters.

Predicting growth parameters. I next examined whether specific covariates including child gender, generational status, maternal education and income, and two dimensions of perceived discrimination predicted individual growth parameters for English use. As generation status increased, youth had higher levels of English use at age 10. Specifically, second generation youth were .39 *SD*s higher in initial English use compared to first generation youth (b = 0.16, p < .01), while third generation youth were 1.06 *SD*s higher than first generation youth (b = .43, p < .001). In addition higher maternal education was related to higher initial English use, such that every additional year of maternal education was related to .05 *SD* higher initial English

use (b = 0.02, p = .006). Initial English use was not related to maternal income, child gender or either dimension of perceived discrimination. In addition, no covariates predicted English use slope (see Table 13).

American cultural values (ACV). The average initial level of youth ACV was 2.52 out of 4, with youth decreasing an average of approximately .57 *SD* across age 10 to age 15 at a rate of -0.04 unstandardized units per year. There were individual differences in initial (age 10) youth ACV, with approximately 68% (± 1*SD* of youth) starting between 2.14 and 2.90 (λ = 0.14, p < .001). Likewise, there were between-individual differences in degree of change across ages 10 – 15 (λ = .006, p = .006), but similar to English use, this variation in change over time was best understood in the context of a notable association between initial levels and change over time (β = -0.55, p < .001). Probing the relation between intercept and slope suggested that youth with initially higher levels of ACV at age 10 had greater decreases in their ACV over time (see Figure 24). While youth at average levels of ACV at age 10 decreased over a half of a standard deviation (.57 *SD*) across age 10 – 15, youth at low levels of ACV did not change noticeably with a decrease of -.001 unstandardized units per year (-0.01 *SD* decrease across age 10 – 15), while youth at high levels of ACV decreased more dramatically at -0.09 unstandardized units per year, equivalent to a decrease of -1.13 *SD*s across ages 10 – 15. I next added a fixed quadratic term to the ACV model, and improvement in model fit suggested that youth's average decrease in ACV was best characterized by a quadratic trend (b = 0.01, p = .001; χ^2_{dif} (df = 1) = 11.30, p < .001). To probe the characteristics of the average quadratic growth curve in terms of acceleration or deceleration over time, I next examined the linear slope estimates centered at age 10, 13, and 15 in order to examine the change in the derivative of the quadratic line. ACV showed a deceleration pattern as linear slope decreased from age 10 (b = -0.11, p < .001), to age

13 (b = -0.03, p< .001) becoming closer to zero or flat, and became close to zero at age 15 (b= 0.02, p = .33). This suggests that on average, ACV becomes more stable over time.

Gender moderation. I next examined a multi-group quadratic LGM stacked on gender. Compared to the fully fixed model, the model in which mean intercept term was freed resulted in a better fit to the data, demonstrating that females endorse lower levels of ACV at age 10 (see Table 12). Subsequent models relaxing equality constraints did not provide a better fit to the data compared to model freeing the fixed intercept only. The final multi-group quadratic model (see Figure 23) suggested that girls started out with lower age 10 ACV than boys, although their change over time appeared to be characterized by similar trends. The model for average change trajectories notably overestimated average male ACV at age 10, and overestimated average female ACV at age 14.

Predicting growth parameters. I next examined whether covariates predicted individual linear growth parameters for child ACV. Third generation youth were approximately a half of a SD higher in age 10 ACV compared to first generation youth (b = 0.19, p = .06), while no differences emerged between first and second generation youth. In addition, higher initial ACV was related to lower mother education, with a 0.05 *SD* decrease in initial ACV for each additional year of maternal education (b = -0.02, p = .001). Finally, increased peer and combined peer + teacher discrimination were related to greater initial ACV, with a 0.13 *SD* higher level of ACV for each *SD* increase in peer discrimination (b = 0.40, p = .04), and 0.16 *SD* increase in initial ACV for each *SD* increase in combined discrimination. Initial ACV was not related to maternal income, child gender, or combined discrimination. Notably, higher mother education predicted greater ACV slope, with a .05 *SD* increase in ACV slope for each additional year of maternal education (b = 0.004, p = .03). No other covariates predicted ACV slope.

Enculturation domains.

Spanish use. Average youth Spanish use at age 10 was 2.59 out of 4, and youth Spanish use decreased an average of .03 units per year, or approximately .27 *SD* from age 10 to age 15 (b = -0.03, $p < .001$). There were notable individual differences in age 10 Spanish use, with approximately 68% (i.e., ± 1 *SD*) of youth ranging from 1.97 to 3.21 at age 10 ($\lambda = 0.38$, $p <$ .001). In addition, there was between-individual variation in how much youths changed over time in Spanish use ($\lambda = 0.01$, $p < .001$), although this variation was conditioned by an association with initial levels of Spanish use ($\beta = -0.37$, $p < .001$). I next probed the relation between intercept and slope at low, medium and high levels of age 10 Spanish use, and this suggested that youth with initially higher levels of Spanish use at age 10 had faster decreases in their Spanish use over time (see Figure 26). Specifically, youth at low levels of initial Spanish use were relatively stable in their Spanish use over time, increasing only .09 *SD* from age 10 to 15 at a rate of .01 unstandardized units per year, while youth at high levels of age 10 Spanish use decreased approximately .62 *SD*s over that period at a rate of -0.08 unstandardized units per year. I next added a fixed quadratic term to the model, which demonstrated that youth's average decrease in Spanish use was best characterized by a quadratic trend ($b = 0.01$, $p = .02$; χ^2_{dif} (df = 1)= 5.23, $p < .03$). Although specifying a random quadratic term (and corresponding covariances with intercept and linear slope) did improve model fit (χ^2_{dif} (df = 3)= 25.81, $p < .001$), model results did not show significant variation in quadratic-characterized change (b =0.001, $p = .48$), thus the random quadratic term was dropped. I next probed the characteristics of the average quadratic growth term by examining the linear slope term (the derivative) from age 10 to age 15. The average Spanish use pattern showed a deceleration over time from age 10 (b = -0.08, p = .001), to age 13 (b = -0.03, $p < .001$), and becoming effectively zero at age 15 (b = 0.01, p = .61).

Gender moderation. I next tested whether LGM parameters differed by gender. Compared to the fully fixed model, the model in which mean intercept was freed was a better fit to the data, providing evidence that, on average, females endorse higher levels of Spanish use compared to males (see Table 12). Freely estimating other growth terms did not improve model fit suggesting that on average females and males have a similar rate of change (at age 10), and similar quadratic change in Spanish use (See Figure 25).

Predicting growth parameters. I next examined whether covariates predicted individual growth parameters for child Spanish use. Second generation youth had .41 SD lower age 10 Spanish use compared to 1st generation youth (b = -0.25, p < .001), and 3rd generation youth were 1.75 SD lower than 1st generation youth in initial Spanish use at age 10 (b = -1.08, p < .001). None of the covariates predicted Spanish use slope.

Mexican cultural values (MCV). Youth's average initial level of MCV was 3.50 out of 4, and youth endorsement of MCV decreased an average of .05 units per year, or approximately 1.32 *SD* from age 10 to age 15 (see Figure 27). Youth varied in their MCV at age 10, with 68% of youth between 3.30 and 3.69 (λ = 0.04, p < .001), and there were also between-individual differences in degree of change in MCV (λ = 0.003, p < .001) with 68% of youth changing between -0.11 and .002 unstandardized units per year (or -2.70 *SD* to + .07 *SD* across ages 10 – 15). This finding suggested that while on average youth MCV decreased over time, some youth decreased at an appreciably steeper rate and other youth changed relatively little in their MCV endorsement over time. There was no association between intercept and slope (β = -0.19, p = .28), suggesting that youth initial levels of MCV and change over time were unrelated. I next added a fixed quadratic term to the model (the model had estimation problems when a random quadratic slope was included), which demonstrated that youth's average decrease in MCV was

not better characterized by a quadratic trend (b = -0.002, p = .29; χ^2_{dif} (df = 1) = 1.11, p > .10), so the quadratic term was dropped.

Gender moderation. I next tested whether growth parameters for MCV differed by gender. Chi-square comparisons suggested that relaxing equality constraints for model parameters did not result in significant improvement in model fit suggesting that boys and girls do not differ in their growth parameters for MCV (see Table 12).

Predicting growth parameters. I next examined whether covariates predicted individual growth parameters for child MCV. I found that higher initial levels of MCV use were related to higher levels of perceived *peer* discrimination, with a .13 *SD* higher level of age 10 MCV for each *SD* increase in peer discrimination (b = 0.21, p = .07) at age 10. In addition, greater experience of perceived *combined* discrimination at age 10 predicted greater increases in MCV over time, with a .15 *SD* higher slope for each *SD* increase in combined discrimination (b = 0.10, p = .04). None of the other covariates predicted MCV intercept or slope.

Traditional family values. Average youth family values at age 10 was estimated to be 3.65 out of 4, and youth endorsement of traditional family values decreased an average of .03 units per year, or approximately .51 *SD* from age 10 to age 15. Youth significantly varied in their age 10 family values endorsement, with 68% of youth between 3.30 and 3.69 (λ = .037, p < .001). Similarly there were also between-individual differences in degree of change in traditional family values across age 10 to age 15 (λ = 0.003, p < .01), with 68% of youth changing between -0.09 to + .02 unstandardized units per year (λ = .003, p < .01), or -2.25 *SD* to + .59 *SD* during the age 10 – 15 period. There was no association between intercept and slope (β = -0.27, p = .09), suggesting that youth initial levels of family values and change over time were unrelated. I next added a fixed quadratic term to the model (the model had estimation problems when a

random quadratic slope was included), which demonstrated that youth's average decrease in family values is best characterized by a quadratic trend (b = -0.005, p= .05; χ^2_{dif} (df = 1) = 3.88, p < .05). Probing the quadratic model illustrated that the average decrease in family values accelerated over time, being effectively zero at age 10 (b = -.01, p =.54), with faster decreases from age 13 (b = -0.04, p< .001) to age 15 (b = -0.05, p <.001) (see Figure 28).

Gender moderation. I next tested whether quadratic LGM parameters for Family Values differed between boys and girls. Relaxing equality constraints did not provide a better fit to the data suggesting that growth parameters are similar for boys and girls (see Table 12).

Predicting growth parameters. I next examined whether covariates predicted individual linear growth parameters for child Family Values. No covariates predicted initial level of family values at age 10. However, children perceiving greater *combined* discrimination (from teachers and peers at school) at age 10 had greater increases in Family Values over time, with a .17 *SD* increase in family values slope for each *SD* increase in perceived combined discrimination at age 10 (b = 0.11, p = .03).

Mexican American ethnic pride (MAEP). Average MAEP was 3.58 out of 4, and youth endorsement of ethnic pride decreased an average of .01 units per year, or approximately .21 *SD* from age 10 to age 15. There was between-individual variation in age 10 MAEP, with 68% of youth with initial levels between 3.34 to 3.82 (λ = 0.06, p = .002). Similarly, there were between-individual differences in degree of change over time, with 68% of youth between -0.09 to +0.07 unstandardized units per year (λ = .001, p = .004), equivalent to -1.82 *SD* to +1.40 *SD* from age 10 – 15. There was no association between intercept and slope (β = -0.13, p = .59), suggesting that youth initial levels of ethnic pride and change over time were unrelated. I next added a fixed quadratic term to the model (the model had estimation problems when a random quadratic slope

was included), which demonstrated that youth's average decrease in ethnic pride is best characterized by a quadratic trend (b = -0.01, p = .003; χ^2_{dif} (df = 1) = 8.83, p < .001). Finally, probing the quadratic trend suggested that average MAEP growth accelerated over time in terms of increases in ethnic pride beginning at age 10 (b = 0.04, p = .04) before reversing around age 12, and then demonstrating faster decreases in ethnic pride over time from age 13 (b = -0.02, p = .001), and age 15 (b = -0.06, p < .001).

Gender moderation. Relaxing the equality constraint for the mean intercept provided a better fit to the data, demonstrating that on average females have higher initial levels of ethnic pride (see Table 12). In addition, relaxing the equality constraint for the slope effect also provided a better fit to the data, suggesting that boys and girls show different instantaneous rates of change at age 10. This moderated effect was probed across age 10, age 13 to age 15. The results suggest that females show an early growth in ethnic pride from age 10 to age 12 while males change relatively little during that period ($b_{females}$ = 0.06, p = .003, b_{males}= 0.03, p = .08), and that males have faster decrease in MAEP over time from age 13 ($b_{females}$ = -0.01, p = .12, b_{males}= -0.04, p < .001) and age 15 ($b_{females}$ = -0.06, p = .001, b_{males}= -0.08, p < .001) (see Figure 29).

Predicting growth parameters. I next examined whether covariates predicted individual linear growth parameters for child MAEP. Compared to first generation youth, second generation youth were -.46 *SD* lower in age 10 levels of MAEP, while third generation youth were -1.16 *SD* lower at age 10. In addition, increased mother education was related to higher age 10 ethnic pride, with a .04 *SD* increase in ethnic pride for each additional year of mother education. Finally, increased family income was related to steeper increases in MAEP over time, with a .04

SD increase in MAEP slope for each $5,000 increase in annual family income (b = 0.003, p = .04).

Replication with Multilevel Models

To provide a check on the age sorting method that I implemented for LGMs, I next attempted to replicate unconstrained linear LGMs via multilevel/mixed-effect models using *nlme* in R. In *nlme* age was specified as a random (individually-varying) covariate that is based on specific age (calculated to six decimal places). Results for mixed effect models showing fixed effects (compared to factor means for LGMs) and random effects (compared to factor variance terms for LGMs) are illustrated in Tables 9 (linear models; compare to LGM results in Table 8) and 11 (quadratic models; compare to LGM results in Table 10).

Results for the unconstrained linear LGMs were within .002 to .016 for estimates of fixed intercept effects, within .001 to .005 for estimates of fixed slope effects and within .001 for standard error values for fixed effects. Also within the linear models, random intercepts effect were generally within .001 to .012, except in the case of ACV which was .049 higher in the multilevel model, indicating a notably wider degree of variation (equivalent to a .22 higher *SD*) compared to the estimate from the LGM. The random slope estimates were generally equivalent (rounded to three decimal places) except for MAEP, which was .003 lower in the multilevel model (equivalent to .05 *SD* difference, and indicating a more constrained distribution of slopes compared to LGM). Correlations between intercept and slope were attenuated (by approximately .03 to .20, and were generally lower) in the SEM-based models, indicating that the LGMs may have underestimated the correlation between initial levels and change over time in cultural domains.

Results for the quadratic models demonstrated that intercept fixed effects were within .001 to .007, linear slope fixed effects were within .001 to .006, and quadratic slope effects were within .001 to .003. In addition, random intercept terms were within .001 to .012, and similar to the linear models, estimates for random slope terms were identical except for .003 difference for MAEP. Correlation terms between intercept and linear slopes were attenuated in the multilevel models within .001 to .26.

Most notably, there were two major differences when comparing the form across the final models (i.e., linear versus quadratic) for LGMs versus multilevel models. In the English use multilevel model, the quadratic model was a better fit to the data (Likelihood Ratio (LR) = 5.88, $p = .02$), and the quadratic effect for English was significant ($b = -.009$, $p = .02$) which was inconsistent with results from the LGM model comparison. In the quadratic model youth average English intercept (centered at age 10) was lower ($b = 3.24$, $p < .001$) than in the SEM model (see above), and there was evidence of an average pattern increasing English use with deceleration over time from age 10 ($b = 0.10$, $p < .001$) to age 13 ($b = 0.05$, $p < .001$), with growth slowing to effectively zero to age 15 ($b = .02$, $p = .37$) (see Figure 22). This suggests that, on average, endorsement of English use increases less rapidly as youth get older, and also suggests that there may be a ceiling effect with English use given that many children approach the maximum response of four on the English use measure. The other major difference was evident in the quadratic model for Spanish use, in which the multi-level quadratic model did not significantly improve model fit (LR = 2.86, $p = .09$), in contrast with the significantly improved LGM model. These results suggest that average Spanish use decrease may be best explained by linear trend.

These differences in the form of the curves may be due to idiosyncrasies in the way that time is handled in my specification of SEM-based versus multilevel models (Aydin, Leite &

Algin, 2014). Specifically, the current use of SEM-based LGM necessitated having one age per measurement point, which appears to be somewhat biased, at least in estimating English and Spanish use over time, and this may have been partially due to the manual age-sorting method that I employed. The continuous nature of the way that age was handled in multi-level models may have allowed for a more fine-grained approach to accurately estimate change parameters in the observed data. To examine whether SEM-based LGMs appeared to provide a good approximation of random variation in intercept and slope terms as specified by multilevel models I saved intercept and slope factor scores from Mplus for unconstrained models, and also saved individual intercept and slope estimates, and found that these were highly correlated across the two methods in most cases. The standardized correlation coefficient for model intercepts ranged from R^2 values of .96 to .99. For model slopes, the correlation coefficient was between R^2 = .91 to .95, except for ACV slopes, which were only correlated at R^2 = .62 between the different methods (see Figures 30 to 35).

Compared to multilevel models, which is the more accurate method based on ability to handle time in a more nuanced manner, SEM-based LGMs clearly demonstrated some differences in estimates (which appeared to be minor in most cases) and differences between presence/absence of quadratic effects. However, I move forward with the results of the SEM based linear LGMs as an *approximation* of the growth curve parameters in order to most efficiently address questions in Aim 2 and 3. Specifically, Aim 2 and 3 aims rely on regression with categorical and pseudo-count data, and mediation, respectively, which are much simpler to run in SEM framework. Although it may be possible to conduct regressions with count outcomes, parallel process growth curve models, or to test mediation via structural pathways (after conducting initial growth curves in an multilevel (*nlme*) framework), these analyses would

go well beyond the substantive goal of illustrating that my choice of analytic method was not severely biasing my unconditional models. Thus, I opted for consistency in method into Aims 2 to 3, while trying to show that the foundational growth model estimates from LGMs approximate those from multilevel models.

Also it is important to note that although I found some evidence for quadratic-characterized change for English use, ACV, traditional family values and ethnic pride, I do not incorporate those effects in Aims 2 or 3. For example, I do not model quadratic effects in Aim 2 and use linear slope (e.g., the first derivative of the quadratic curve, or the instantaneous rate of change) to predict substance use outcomes, which is an important question in its own right. I made this decision to simplify already complex models, and to try to balance methodological design with parsimony by taking the next logical step for the literature in this area.

Aim 2: Linking Changes in Cultural Orientation with Substance Use Outcomes

For Aim 2 models, the intercept of cultural LGMs were changed from age 10 to age 15 due to problems running models with age 10 as intercept. Significant associations between intercept and substance use outcomes are interpreted as cross-sectional associations between age 15 cultural orientation and substance use. I interpret and discuss effects in terms of both magnitude and the confidence interval of the estimate. When both the magnitude of the effect was close to zero and the confidence interval contained zero, I considered the association to be effectively zero. Otherwise I report both the magnitude of the effect in terms of unstandardized beta, odds ratio (*OR*), or rate ratio (*RR*), with the 95% confidence interval of the estimate. I utilize forest plots to illustrate the relative magnitude of effects along with the 95% confidence band for estimates to provide information about effect size in the current study and degree of imprecision if it were possible to repeatedly sample these associations. Note that forest plots for

Rate Ratios and *Odds Ratios* are appropriately plotted on a logarithmic scale. Because of the large number of tests, I also provide a summary table (see Table 21) that provides an illustration of effects across Aim 2 models (not including PPGMs).

Age 15 substance use intentions.

Model building steps. I first tested how cultural orientation dimensions level and change predicted age 15 substance use intentions (SUI). To examine appropriate model specification based on the distribution of SUI, I ran a set of covariates-only models assuming a continuous, zero-inflated Poisson (ZIP), zero-inflated negative binomial (ZINB), or zero-inflated hurdle (ZIH) distribution of age 15 SUI. The most optimal fit according to AIC and BIC was the continuous (i.e., Gaussian)-specified model (see Table 14). Despite the less optimal fit compared to the continuous-specified model, the ZINB-specified model provided a measure both of presence (i.e., logit portion) and degree (i.e., count portion) of SUI, and thus I decided to examine both the continuous-specified and ZINB-specified models to look for convergence and divergence across methods. Full-information maximum likelihood was used to examine all available data ($N = 662$ in the following analyses) using maximum likelihood with robust standard errors. A forest-plot summary of model estimates and confidence intervals are provided in Figures 36 (continuous specified models) and 37 (ZINB-specified models).

English use. In the continuous English use model, greater level of English use at age 15 predicted greater degree of SUI at age 15 with a one *SD* (.36) increase in English use equal to a .18 *SD* increase in SUI ($b = 0.17$; 95% CI [0.04, 0.31]). The confidence interval for this effect did not contain zero and was narrow, suggesting that there is a small positive effect of age 15 English use on SUI level at age 15. Furthermore, greater increases in English use from age 10 to age 15 were related to lower degree of SUI, with a one *SD* increase in English use slope

equivalent to a .30 *SD* decrease in SUI (*b* = -1.12; [-1.82, -0.41]) (See Table 15 and Figure 36). Compared to other predictors (see Figure 36), English use slope had the second largest effect on SUI level in terms of magnitude, and did not contain zero suggesting that repeated samplings would likely indicate a protective effect of increasing English use across ages 10 - 15.

Similarly, in the ZINB English use model (see Table 16 and Figure 37), greater level of English use at age 15 predicted greater degree of SUI (*RR* = 1.30, 95% CI 1.06-1.60) [2], demonstrating that a one *SD* increase in English use intercept (*SD* = .358) was related to 30% increase in SUI. Compared to the other predictors (see Figure 37), the effect for English use had the second largest magnitude in the positive direction, and the confidence interval did not contain zero. Greater increases in English use from age 10 to 15 predicted lesser degree of SUI (*RR* = 0.75, 95% CI 0.59-0.95), suggesting that a one *SD* increase in slope of English use (*SD* = .089) is related to 25% decrease in SUI. Figure 38 plots the association between English use intercept and slope with predicted count of SUI, which shows that, youth with steeper gains in English use have decreasing levels of SUI, while youth who are decreasing in their levels of English use have increasing levels of SUI. Also in the ZINB model, the effect of English use level on any SUI was estimated to be close to zero although the width of the confidence band suggested that over repeated samples there might be evidence for a small negative or positive effect. Finally, in the logistic portion of the model, there was a positive effect of English use change on likelihood of having zero SUI (*OR* = 1.58, 95% CI 0.88, 2.83), suggested that for each *SD increase in* English use slope there was a 58% decrease in the likelihood of having any substance use. I note that although English use slope has the second largest effect size (as a protective effect; see Figure

[2] Rate ratios and odds ratios for substance use outcomes are converted to *SD* units for more accurate interpretation of effect size. $RR = e^{(b * SD\text{variable})}$

37), the confidence band contains zero suggesting that it is difficult to know what the true effect might be across repeated samplings, and it may very well be less dramatic.

Taken together, these results suggested that although greater English use at age 15 is a risk factor for age 15 SUI, greater increases in English use across age 10 – 15 may be protective as measured both by the degree of SUI as well as the likelihood of any SUI. This is likely due to the fact that those with the lowest level of initial level of English use have the greatest increases over time, suggesting that in this case delayed linguistic acculturation (i.e., increased English use) into adolescence may be protective.

American cultural values (ACV). In the continuous model, level of ACV did not appear to be related to SUI. Higher slope of ACV was associated with greater age 15 SUI (b = 0.66; [-0.45, 1.76]), translating into a .15 *SD* increase in SUI for each *SD* increase in ACV. This effect was the greatest magnitude (in the positive direction) relative to other effects (see Figure 36, although the confidence interval was relatively wide and contained zero suggesting that repeated samplings might uncover a larger or smaller effect.

In the count portion of the ZINB model, greater ACV level at age 15 was associated with higher degree of SUI (*RR* = 1.13, 95% CI 0.80, 1.59), suggesting a 13% increase in SUI for each *SD* increase in age 15 ACV. On the other hand, greater ACV slope was associated with decreased age 15 SUI (*RR* = 0.83, 95% CI 0.53, 1.30), with a 17% decrease in the degree of SUI for each *SD* gain in ACV slope. Yet in both cases the confidence interval was relatively imprecise and contained zero, suggesting across repeated samplings the effects might be larger, zero, or even in the opposite direction. In the inflation portion, greater age 15 ACV was associated with higher likelihood of being in the zero class (*OR* = 1.50, 95% CI 0.67, 3.35), suggesting that for each *SD* increase in age 15 ACV, youth had a 50% decrease in the likelihood

of having any SUI. Alternatively, increased growth (slope) of ACV was associated with lower likelihood of having zero SUI (i.e., being in the excess zero class) at age 15 (*OR* = 0.27; 95% CI 0.07-1.04). For each one *SD* (.07) increase in ACV slope, the likelihood of having no substance use intentions decreased by 73%. I plotted the association of ACV slope with the probability of having any SUI (note that this was recoded from the ZINB model, which predicted likelihood of zero SUI), and this result suggested that steeper ACV slopes were associated with greater risk of having any SUI (see Figure 39). Notably, this was the largest effect out of all cultural predictors for the logistic portion of SUI (see Figure 37), yet the confidence band was quite wide suggesting some imprecision in estimating the effect, and also suggesting the true effect might be larger or close to zero.

Overall, the strongest evidence among these effects suggested that greater American values acculturation (i.e., increases in Americanism over time) was related to increased probability of having any SUI, although this effect in itself was somewhat tenuous given the width of the confidence band. The implications of other effects were more questionable given that they were much smaller in magnitude and the confidence bands contained zero, suggesting the effects might actually be in the opposite direction.

Spanish use. In the continuous model, there was no evidence for an effect of Spanish use level and change on SUI. In the ZINB model, higher age 15 Spanish use was associated with lower degree of SUI at age 15 (*RR* = .84, 95% CI 0.69-1.03), translating into a 16% decrease in SUI for every one *SD* (.67) increase in age 15 Spanish use. I plotted the association between Spanish use level at age 15 and SUI count, which indicated a gradual increase in risk for lower age 15 Spanish use (see Figure 40). Notably, this predicted curve did not overlap with higher values of SUI count, which suggested that the model may be biased downwards. Overall, this

model suggested that higher Spanish use in mid-adolescence has a small protective effect in lowering substance use risk, which would provide support for the protective effects of maintaining Spanish language use. Also in the count portion of the model, greater change was associated with higher degree of age 15 SUI (*RR* = 1.11, 95% CI 0.89-1.38) suggesting an 11% increase in SUI for each *SD* gain in Spanish use slope. Yet, the confidence band for the effect contained zero suggesting that the effect might actually be zero or in the opposite direction. In the inflation portion of the model, greater age 15 Spanish use was associated with lower likelihood of being in the zero class (*OR* = 0.73, 95% CI 0.47-1.11), suggesting a 17% *increase* in the likelihood of any SUI at age 15 for each *SD* increase in age 15 Spanish use. This effect appeared to be relatively small, and the confidence band included zero suggesting that it is possible that no effect would emerge with repeated samplings. Furthermore, greater slope of Spanish use was associated with higher likelihood of being in the zero class (*OR* = 1.21, 95% CI 0.71-2.04), translating in to a 21% *decrease* in the likelihood of having any SUI at age 15 for each *SD* increase in Spanish use slope. This effect also appeared to closer to zero and imprecise as judging from the confidence interval, suggesting that repeated samplings might uncover a larger, smaller, or opposite effect.

Overall, these results provide conflicting and limited support for the effects of age 15 Spanish use. On one hand, greater age 15 Spanish use may be a risk factor for having any SUI, while higher use of Spanish at that age may be protective in relation to lower degree of age 15 SUI. Taken together, the evidence for any effect of Spanish use on age 15 SUI is tenuous at best.

Mexican cultural values (MCV). The continuous MCV model suggested that level of MCV at age 15 was unrelated to SUI level at age 15. This model also suggested that there was an inverse association between MCV slope and SUI level (*b* = -0.89; [-2.94, 1.16]), with a .14 *SD*

decrease in age 15 SUI for each *SD* increase in MCV. Relative to the other estimates (as shown in Figure 36), the effect of MCV slope appeared to be small to moderate, although it should be noted that the confidence interval was relatively wide and contained zero suggesting that the population effect may be more dramatic or closer to zero over repeated samplings. In the ZINB model, higher age 15 level of MCV was related to greater degree of SUI (*RR* = 1.25, 95% CI 0.84, 1.86), with a 25% increase in SUI for each *SD* increase in MCV. Paradoxically, steeper increases in MCV over time was related to lower degree of SUI (*RR* = 0.67, 95% CI 0.39, 1.14), translating into a 33% decrease in SUI for each *SD* increase in slope. Importantly, this was the second largest protective effect for SUI, however, the confidence band was relatively wide and included zero, which suggested that the true effect may be more dramatic or closer to zero. In the inflation portion of the model, there was a large protective effect of age 15 MCV on likelihood of any SUI (*OR* = 1.96, 95% CI 0.72-5.33), which suggested a 96% *decrease* in the likelihood of having any SUI for each *SD* increase in age 15 MCV. Relative to the other predictors, age 15 MCV had the largest protective effect on SUI likelihood (see Figure 37), although the confidence band was quite wide suggesting that the effect may indeed be larger, or closer to zero. Finally, greater MCV slope was associated with lower likelihood of being in the zero class (*OR* = 0.72, 95% CI 0.21, 2.43) suggesting that there is a 28% *increase* in the likelihood of having any SUI for each *SD* increase in MCV slope. Although this was the second largest risk effect for SUI likelihood, the width of the confidence band was considerable, suggesting that across repeated samplings the effect might be very different than the current point estimate.

Taken together, the strongest evidence from these results suggested that steeper increases in MCV slope across ages 10 – 15 was associated with decreased levels of SUI at age15. Given that the average MCV slope was negative (see Aim 1 results), this implied that less steep

decreases (in addition to increases) in MCV were protective, suggesting a protective effect of cultural heritage maintenance. Furthermore, there was a relatively large protective effect of greater age 15 MCV associated with decreased likelihood of any SUI at age 15. Although the true effect might indeed be smaller with repeated samplings, this finding accentuates the importance of maintaining Mexican cultural heritage in relation to decreased SUI risk. I was very interested to determine whether these effects were similar for traditional family values (in the next section) given that family values items make up a large part of the MCV subscale, and these measures are highly correlated.

Traditional family values. The continuous model demonstrated that level of family values at age 15 was unrelated to age 15 SUI. Yet, greater increases in family values across ages 10 – 15 were associated with lower degree of SUI (b = -0.97; [-3.19, 1.24]), which translated into a .16 *SD* decrease in SUI for each *SD* increase in family values slope. Although this was one of the larger magnitude effects in the continuous model, the wide confidence band implied that there was a high degree of uncertainty in terms of the true effect size, thus across repeated samplings the protective effect might be larger, smaller, or there might even be a risk effect. Similarly, in the ZINB model, both the count and logistic portions suggested that level of family values at age 15 was unrelated to degree or likelihood of any SUI. In the count portion of the ZINB model, there was a small protective effect of family values slope (*RR* = 0.85, 95% CI 0.55-1.33), translating into a 15% decrease in SUI for each one *SD* increase in family values slope. Furthermore, the logistic portion of the model indicated a similar protective effect of family values slope (*OR* = 1.33, 95% CI 0.50-3.57), indicating a 33% *reduction* in the likelihood of any SUI for each *SD* increase in family values slope. For both slope effects, the magnitude appears to be small relative to English use, MCV and ethnic pride (see next section), and the confidence

interval contained zero, suggesting that the effects might either be smaller or larger over repeated samplings.

Summing up these results, there appears to be tenuous evidence for a small protective effect in maintaining traditional family values over time, which is also in line with results for MCV.

Mexican-American ethnic pride (MAEP). There was a small risk effect for level of MAEP at age 15 in relation to age 15 SUI (*b* = 0.29; [-0.22, 0.81]), with a .25 *SD* increase in age 15 SUI for each *SD* gain in age 15 MAEP. More notably, the magnitude of the effect for MAEP slope in the continuous specification of SUI (*b* = -2.50; [-6.40, 1.41]), was the largest out of all predictors in the continuous models. This translated into a .57 *SD* decrease in SUI level for each one *SD* increase in MAEP. Similarly, in the count specification of the ZINB model, there was a large risk effect for level of MAEP at age 15 (*RR* = 1.52, 95% CI 0.78-2.98), with a one *SD* increase in MAEP related to a 52% increase in SUI at age 15. Paradoxically, there was also a protective effect of MAEP slope (*RR* = 0.61, 95% CI 0.28-1.34], translating into a 39% decrease in the level of age 15 SUI for each *SD* gain in MAEP slope. Plotting the effect for slope of MAEP on SUI suggested that this was a robust protective effect, although there was also uncertainty in the magnitude and direction of the effect as implied by the lower and upper (95%) bounds of the predicted curve (See Figure 41). Thus, these effects were simultaneously the largest out of all cultural slope predictors, but also had the widest confidence bands and contained zero suggesting a great deal of imprecision in effect estimation.

In the logistic portion of the model, there were estimation problems for the effect of MAEP intercept on age 15 SUI resulting in a non-sensical effect (*OR* = 16913.81). However, the model did suggest a slight risk effect of MAEP slope on SUI level (*OR* = 0.86, 95% CI 0.65-

1.15), with a 14% *increase* in the risk of any SUI for each *SD* increase in MAEP slope. Notably, this effect was small in magnitude and the confidence band included zero, implying that the estimate was imprecise, and the effect likely less influential compared to slope of other cultural predictors, for instance, American Cultural Values change.

Generally, these results suggested that there may be large effects for level and change in MAEP, and these effects may be paradoxical with maintenance of MAEP over time being protective, whereas higher level of MAEP at age 15 is a risk for SUI. The imprecision of these estimates suggest that the size of these effects may bounce around with additional sampling, and importantly the effect sizes may be less dramatic than the point estimates that I found.

To summarize the results of the previous analyses examining age 15 SUI, and placing the greatest weight on the continuous models (which had the best fit), I found the strongest evidence for a moderate protective effect of increasing English use slope, a small risk effect for higher age 15 English use and a moderate to large effect of increased ACV slope on higher likelihood of any SUI. There was moderate evidence for a risk effect of increased ACV slope on higher degree of SUI, a small effect of higher Spanish use level on lower degree and likelihood of SUI. There was tenuous evidence for a small to moderate protective effect of increase MCV slope, suggesting that maintenance of heritage cultural values may be an important factor as related to substance use risk. There was also tenuous evidence for large effects of increased MAEP slope as protective effects in relation to degree of SUI, although paradoxically, increased MAEP level appeared to be a risk factor for greater degree of SUI. Additional sampling should provide greater information as to the true effect size, and it is important to further disentangle why degree of change in MAEP and final level (controlling for the other), might produce paradoxical effects on substance use risk.

Cultural orientation and substance use intentions parallel process growth models.

To further examine cultural change and substance use risk as developmental processes, I next tested how changes in cultural orientation may be related to changes in SUI over time within a parallel process growth modeling (PPGM) framework. I first ran a set of unconditional latent growth models to determine the appropriate model specifications (i.e., distributional assumptions) to characterize growth in substance use intentions over time. Models were run using MLR with all available data from substance use intentions variable. I first attempted to test models specifying SUI at each time point as a count distribution, using ZIP. These models had convergence problems, potentially due to sparse non-zero values at the earlier time points (age 10-12; see Figure 2).

PPGM for any substance use intentions from age 10 – 15. I then collapsed SUI into a dichotomous variable (0= no SUI, 1= any SUI) at each time point. In the initial model building steps, I first ran an unconditional LGM model for SUI across age 10 – 15 specifying SUI as a categorical outcome, and estimating the model using Maximum likelihood with robust standard errors (which is appropriate due to high missingness of substance use intentions measure at adjacent time points) in which parameters were derived using the logit link function. Maximum likelihood estimation with categorical outcomes do not provide traditional SEM fit statistics for overall model fit. This model specified the intercept of SUI likelihood at age 15, and the mean intercept was fixed at zero. A significant fixed slope term indicated that the average likelihood of any SUI increased across ages 10 – 15. There was also significant variation in intercept (λ = 10.31, p = .001) and slope (λ = 0.89, p = .004), suggesting that there was significant variation in age 15 likelihood of any SUI, and also variation in degree of change in likelihood of any SUI across ages 10 – 15. I then ran a LGM model for any SUI with growth factor parameters

conditional on covariates (including child gender, family income, mother education, and two dimensions of child perceived discrimination). There were no statistically significant covariates, with a marginal positive association between family income and steeper increases in SUI likelihood over time ($b = 0.03$, $p = .08$). I then ran a series of PPGMs to examine whether growth parameters from cultural change models were related to changes in SUI over time.

In the full model (see Figure 10 for example), the main parameter of interest was the covariance between slope growth factors (parameter *a*), which tests whether greater changes in cultural orientation over time are related to increasing likelihood of having any SUI across age 10-15. I was also interested in testing cross-sectional associations between the intercepts of culture and SUI likelihood at age 15 via a regression parameter (i.e., regressing SUI on culture) (parameter *b*), and links between cultural slope and age 15 SUI likelihood. I also specified associations between intercept and slope of culture (*e*), and between intercept and slope of the SUI growth parameters (*f*), which modeled covariances between change from age 10-15 and level at age 15. In all models, covariance parameters *e* and *f* were significant indicating that greater increases in culture and SUI likelihood across age 10 – 15 were associated with greater age 15 endorsement of the particular cultural domain and SUI likelihood, respectively (see Table 17).

For all models I first note the unstandardized covariance term for slope of cultural domain on slope of SUI likelihood. I then describe plotted values to illustrate the effect of PPGM parameters translated to show the effect on probability of SUI across ages 10 – 15. These models take into account the average slope value and the effect of cultural slope on SUI level, which provides an estimate (centered at age 15) of the nature of changes in SUI likelihood and is more informative than simply plotting effects on SUI slope.

Acculturation Domains.

English use. In the English use model, there was a negative association between English use change and change in SUI likelihood suggesting that steeper increases in English were associated with slower increases in SUI likelihood over time (*b* = -.014, *Standard Error (SE)* = .01). Plotting the PPGM parameters in terms of probability of SUI across ages 10 – 15 suggested that youth with low levels of change in English use were estimated to have a notable acceleration in risk for any SUI from age 10 – 15, while youth with high levels of English use change had much more gradual increases in risk for any SUI across ages 10 – 15 (see Figure 42). This result extends findings from the ZINB model of SUI at age 15 above, suggesting that linguistic acculturation is linked with lower risk of SUI as these processes unfold together over time. Model estimates for the cross-sectional regression showed that greater age 15 English use predicted greater likelihood of any SUI at age 15 (*b* = 1.34, *SE* = .09). I also found that steeper increases in English use over time were related to lower likelihood of SUI at age 15 (*b* = -13.90, *SE* = 3.42), which reinforced earlier findings suggesting that a steeper rate of English use development is a protective factor for SUI.

American cultural values (ACV). The covariance parameter for the parallel processes suggested that steeper increases in ACV were related to increasing likelihood of SUI over time (*b* = 0.015, *SE* = .01). Probing this relation suggested that youth who maintained or increased in their ACV endorsement had a notable acceleration in probability of having any SUI over time, while youth who decreased their endorsement of ACV over time (i.e., the low ACV slope group) had a much more gradual increase in probability of having any SUI (See Figure 43). Furthermore, I also found a significant regression path in which greater increases in ACV over time were associated with lower likelihood of SUI at age 15 (*b* = 13.63, *SE* = 5.60). These

finding provides additional evidence that American values acculturation over time may be linked with concurrent increases in substance use risk.

Enculturation Domains.

Spanish use. Changes in Spanish use were not related to changes in the likelihood of SUI over time (b = -.01, SE = .02). This implied that maintenance of Spanish use did not exert a protective effect (via decreased probability of SUI over time) as expected (See Figure 44). In addition, evidence suggested that age 15 Spanish use did not predict age 15 SUI likelihood (b = -0.14, SE = .59). Slope of Spanish use was not related to age 15 substance use likelihood (b = -0.56, SE = 4.71). In combination with results for Spanish use in predicting age 15 SUI presented above, these null results suggested that, unlike English use, changes in Spanish use are not linked with substance use risk, either developmentally or cross-sectionally.

Mexican cultural values (MCV). The covariance between the slopes indicated that steeper increases in MCV were not associated with changes in the likelihood of SUI over time (b = -.003, SE = .003). Probing the association suggested that any effect of MCV slope on slope of SUI probability was likely very small in magnitude (see Figure 45). The cross-sectional regression path indicated that greater age 15 MCV predicted lower likelihood of any SUI at age 15 (b = -1.02, SE = .08). In addition, increased slope of MCV appeared to have a small protective effect (relative to the corresponding pathway in PPGMs for other cultural predictors) as related to lower probability of SUI at age 15 (b = -5.59, SE = 3.15). Taken together, these results suggest that although MCVS and probability of any SUI do not appear to change together over time, increased Mexican heritage values exert a consistent protective effect, both cross-sectionally and prospectively, in terms of decreased probability of any SUI at age 15.

Traditional family values. The covariance between slopes indicated that greater increases in traditional family values were associated with slower increases in likelihood of SUI over time (b = -0.007, SE = .004). This moderate effect (relative to corresponding covariance terms for PPGMS) implied that youth with the fastest decreases in family values over time had the steepest acceleration in probability of any SUI over time, while youth who maintained or increase in their family values had a more gradual increase in likelihood of any SUI (see Figure 46). There was a cross-sectional association with greater age 15 family values predicting higher likelihood of any SUI at age 15 (b = 0.47, SE = .09), however, the other regression pathway of interest suggested that increased slope of traditional family values was associated with lower probability of any SUI at age 15. These findings suggest that maintenance of traditional family values is linked with decreased probability of any SUI (and therefore substance use risk) over time.

Mexican-American ethnic pride (MAEP). Results showed a robust protective effect for MAEP, such that steeper increases in MAEP were related to slower growth in the likelihood of any SUI (b = -0.015, SE = .005). Probing this result suggested that youth that had steeper declines in ethnic pride over time had faster concurrent increases in probability of any SUI, while youth who maintained or increased in their ethnic pride over time had much more gradual increases in SUI probability over time (see Figure 47). In the cross-sectional regression pathway, higher MAEP was associated with higher likelihood of any SUI at age 15 (b = 2.27, SE = .09). At the same time, steeper increases in (i.e., maintenance of) MAEP across ages 10 – 15 were associated with a notably lower likelihood of any SUI at age 15. The paradoxical nature of these last two effects mirrors the corresponding effects from the ZINB model above.

Taken together, I found that a low degree of English use change, steeper inclines for ACV, and steeper declines (i.e., greater erosion of heritage culture) in traditional family values

and ethnic pride were robust markers of risk for concurrent acceleration in the likelihood SUI. These findings supplement those above from the continuous and ZINB models in noting the cross-sectional and prospective risk effects, particularly, among youth with high levels of English use over time, increasing/maintained levels of American values, and also among youth with more dramatic erosion of heritage culture as indicated by MCV and traditional values, and also ethnic pride.

Age 15 past three month alcohol use intensity.

Model building steps. I next ran a series of models with cultural level and change predicting actual substance use, in this case measured by alcohol use intensity (variety x frequency) specified as a count variable. I first tested a set of covariates only models to examine model fit when alcohol use intensity was specified as a continuous, zero-inflated Poisson (ZIP) or zero-inflated negative binomial (ZINB) (I was not able to produce estimates from the hurdle model due to computation problems). Model fit was most optimal in the ZIP model (see Table 14). In the ZIP model the dispersion parameter was non-significant suggesting that the mean and variance of age 15 alcohol use intensity were not significantly different. Male gender (RR = 1.72, p = .03), and age 10 combined peer and teacher discrimination (RR = 1.15, p = .06) were related to greater degree (i.e., count portion) of alcohol use intensity. These estimates suggested that boys had a 72% greater degree of alcohol use intensity that girls, and that for a one SD increase in age 10 perceived discrimination (SD = .08), youth had 15% higher degree of alcohol use. In the inflation portion of the model, no covariates predicted the likelihood of having zero alcohol use (p > .16). I next ran a series of LGMs that regressed presence (logit portion) and degree (count portion) of age 15 alcohol use intensity on level and change in cultural orientation. Results are presented in Table 18 and estimates are presented in forest plots shown in Figure 48).

English use. Level of English use at age 15 (*RR* = 1.74, 95% CI 1.18-2.55) and change in English use from age 10 to 15 (*RR* = 0.56, 95% CI 0.38-0.83) were related to degree of past 3 month alcohol use intensity at age 15, such that a one SD increase in English use at age 15 (*SD* = 0.36) was related to 74% increase in alcohol use intensity, whereas a one SD increase in English use from age 10 – 15 (*SD* = .09) was related to 44% decrease in alcohol intensity. These findings mirror those from the ZINB models for SUI at age 15 in suggesting that increased linguistic acculturation is protective while greater English use at age 15 (controlling for English use slope) is a risk factor for degree of SUI (see Figure 49). Importantly, the magnitude of these effects were relatively large (compared to other cultural predictors) and the confidence bands were relatively narrow and did not contain zero implying that repeated sampling for this effect would indicate consistent robust effects. In addition, results from the inflation portion demonstrated a protective effect of greater English use level at age 15 (*OR* = 1.65, 95% CI 0.94-2.89) with a 65% increase in the likelihood of being in the zero alcohol use class for each SD increase in age 15 English use. Furthermore, there was also a small effect of increased English use slope on likelihood of having zero alcohol use (*OR* = 1.13, 95% CI 0.58-2.18), with a 13% reduction in the likelihood any alcohol use class for each SD increase in English use slope. However, the confidence band for this effect contained zero, suggesting that the effect was possibly closer to zero, larger, or in the opposite direction. These findings generally coincide with those for SUI, providing evidence that steeper linguistic acculturation (gains in English use over time) was associated with decreased alcohol use intensity, while greater age 15 English use (controlling for slope effects) was associated with increased alcohol use intensity at age 15.

American cultural values (ACV). I found that greater increases in ACV from age 10 to 15 were related to lower degree of past three month alcohol use intensity (*RR* = 0.59; 95% CI

0.38-0.92), signifying that an increase of one *SD* in ACV (*SD* = .07) was related to 41% decrease in age 15 alcohol intensity. I plotted the effect of ACV slope on predicted count of alcohol use intensity, which illustrated that, in the opposite direction as predicted, steeper increases in ACV were actually protective against higher degree of alcohol use (see Figure 50). This effect was large in magnitude and appeared relatively robust given the narrow confidence band that did not contain zero (see Figure 48). Level of ACV at age 15 did not uniquely predict degree of alcohol intensity judging by its effect size that was close to zero (i.e., one for Rate Ratio). Furthermore, greater increases in ACV were associated with lower likelihood of being in the zero class (*OR* = 0,68, 95% CI 0.31-1.50], implying a 32% increase in probability for having any alcohol use for each *SD* increase in ACV slope. As indicated by the confidence interval, there appeared to be no relation between intercept of ACV and age 15 alcohol use likelihood.

Enculturation domains.

Spanish use. Spanish use at age 15 was associated with lower degree of alcohol use intensity at age 15 (*RR* = 0.77, 95% CI 0.53-1.14), suggesting that there was a 23% reduction in alcohol use intensity for each *SD* increase in age 15 Spanish use. This effect appeared to be relatively small in magnitude, and the confidence interval contained zero suggesting that the effect might be closer to zero, or might also be larger, upon repeated sampling for this effect. On the other hand, greater increases in Spanish use from age 10 to 15 was associated with greater alcohol use intensity (*RR* = 1.35, 95% CI 0.64-2.83), translating into a 35% increase in alcohol use intensity for each *SD* gain in Spanish use slope. Notably, the magnitude of this effect was larger compared to that of Spanish use intercept, however, the confidence interval was much larger and went further in the opposite direction suggesting that this effect was imprecise and might bounce around from higher to lower to values in the opposite direction with repeated

samples. The effect size and confidence interval for alcohol use likelihood suggested that there were no effects for Spanish use change over time, or Spanish use at age 15. The findings above suggesting greater age 15 Spanish use exerts a protective effect while steeper Spanish gains exert a risk effect are tenuous at best and, unless confirmed by additional study, suggest that Spanish language use may not play an influential role in the development of alcohol use at age 15.

Mexican cultural values (MCV). Greater increases in MCV were related to lower degree of alcohol use intensity (*RR* = 0.54, 95% CI 0.30-0.97), in which a one *SD* increase in MCV (*SD* = .06) was related to a 46% reduction in alcohol use intensity. This finding suggested that maintenance of Mexican cultural values play a protective role related to alcohol use at age 15 (see Figure 51), providing additional support for Mexican value enculturation as a protective process. Level of MCV exerted a very small risk effect on alcohol use intensity (*RR* = 1.15, 95% CI 0.64-2.09), however, the confidence interval was large suggesting uncertainty in the size and direction of this effect. Similarly for the logistic portion of this model, neither level of MCV nor change in MCV appeared to uniquely predict the likelihood of any three-month alcohol use. Taken together, there was evidence for a robust protective effect of MCV slope on lowered alcohol use intensity, however, there was little other evidence for an influential role of Mexican heritage values.

Traditional family values. Similar to the effect of MCV, greater increases in traditional family values were related to lower degree of alcohol use intensity (*RR* = 0.56, 95% CI 0.31, 1.02), with a one *SD* increase in FAMV (*SD* = 0.05) equal to a 44% decrease in alcohol use intensity. This finding parallels those above for SUI suggesting that the maintenance of traditional family values exerts a protective effect against substance use. The magnitude of this effect was quite large, although the confidence included zero suggesting that the effect might be

considerably smaller upon repeated sampling. Greater family values at age 15 was associated with somewhat higher degree of alcohol use intensity (*RR* = 1.35, 95% CI 0.67-2.69), suggesting a 35% increase in alcohol use intensity for each *SD* gain in traditional family values. This effect was relatively small and the confidence band was wide and contained zero, suggesting that this effect is uncertain. Greater family values slope was associated with lower likelihood of having zero alcohol use (*OR* = 0.59, 95% CI 0.20-1.70), while higher family values at age 15 was associated with greater likelihood of having zero alcohol use (*OR* = 1.35, 95% CI 0.67-2.69), suggesting that there was a 35% *reduction* in risk for any alcohol use with each *SD* gain in age 15 values. Although the magnitude was relatively large for these effects, the confidence band contained zero and thus the precision of the effect was uncertain. In that regard, I used caution in interpreting effects for both cultural predictors in the logistic portion of the model. Overall, there was strong evidence for a protective effect of maintaining traditional family values, adding additional support for this process.

Mexican-American ethnic pride (MAEP). Results indicated that greater increases in MAEP were associated with lower degree of alcohol use intensity (*RR* = 0.45, 95% CI 0.18-1.10), suggesting that for a one SD increase in MAEP slope (*SD* = .07), there was a 55% reduction in alcohol use intensity (see Figure 52). This finding implies that the development and maintenance of ethnic pride may exert a protective effect related to alcohol use levels. At the same time, I also found that age 15 level of MAEP was associated with higher degree of alcohol use intensity (*RR* = 1.62, 95% CI 0.72-3.69), suggesting there was a 62% increase in alcohol use intensity for each *SD* increase in ethnic pride. Furthermore, greater age 15 MAEP was associated with lower likelihood of being in the zero class (*OR* = 0.55, 95% CI 0.11-2.76), suggesting a 45% *increase* in risk of any alcohol use for each *SD* gain in age 15 MAEP. Paradoxically,

steeper increases in MAEP across age 10 – 15 was associated with increased likelihood of being a zero (*OR* = 2.00, 95% CI 0.27-14.83), suggesting a 100% increase in the likelihood of having no alcohol use for each SD gain in slope. Although the effects for MAEP were among the largest in magnitude for all cultural predictors, in most cases their confidence interval was also very wide and contained zero, suggested that there was extreme uncertainty in the direction and magnitude of effects. The strongest evidence was for a protective effect of maintaining ethnic pride as related to decreased rate of alcohol use intensity.

Age 15 past three-month alcohol use- any use.

To supplement results from the ZIP count models, I next examined a series of models where I collapsed age 15 past three month alcohol use into any use versus non-use across all types of alcohol (i.e., beer, wine, or liquor) to ensure that the sparse non-zero values (8.5% had any alcohol use) were not causing estimation issues. Results from these models are shown in Figure 53 and Table 19. In general, the magnitude of effects and the corresponding confidence intervals suggested that there were few associations between cultural predictors with likelihood of any alcohol use. Ethnic pride growth parameters evidenced the largest effect sizes. Increased growth of ethnic pride exerted a protective effect (*OR* = 0.27, 95% CI 0.02-4.37) with a 73% reduction in alcohol use likelihood per *SD*. On the other hand, increased MAEP at age 15 exerted a risk effect (*OR* = 2.07, 95% CI 0.38-11.08), with a 107% increase in alcohol use likelihood per *SD*. The confidence intervals for these effects were notably wider than for other cultural predictors suggesting that the effect was imprecise, and could be virtually either direction at any magnitude. The strongest evidence appeared to be, once again, for English use slope, such that greater English use slope was associated with a lower risk of any alcohol use (*OR* = 0.68, 95%

CI 0.63-1.27), suggesting a 32% reduction in risk for any alcohol use for each *SD* gain in English use slope.

Age 15 past three-month cannabis used

I next specified a series of logistic regression models using covariates and LGM parameters to predict likelihood of any cannabis use in the past three months at age 15. In the covariates only model, results demonstrated that boys were 86% more likely to have used cannabis in the past three months (*OR* = 1.86, *SE* = .96). These effects were somewhat similar to those for any alcohol use above. In general, the effects were quite small and the confidence bands were quite large and contained zero (See Figure 54 and Table 20). Again, MAEP slope (*OR* = 0.33, 95% CI .02-6.08) and intercept (*OR* = 2.69, 95% CI .24-30.08) had the largest magnitude of effects (greater slope was protective while greater level at age 15 was a risk factor), although the confidence bands were very wide and contained zero, leading to my caution in interpreting effects. Three moderate effects were apparent, with greater ACV slope associated with lower risk (*OR* = 0.63, 95% CI .27-1.51), greater MCV slope associated with lower risk (*OR* = 0.58, 95% CI .18-1.87), and higher age 15 MCV associate with higher risk (*OR* = 1.55, 95% CI .63-3.81) of any cannabis use. There was also a small effect where greater age 15 ACV was related to higher risk of any cannabis use (*OR* = 1.453, 95% CI .91-2.31). Out of all of these effects, the most likely to be replicated was probably the risk effect of ACV intercept. Overall, the results for alcohol and cannabis use suggested that there may be less power to detect effects of any vs. no substance use compared to breaking down these processes into count and logistic component parts.

Aim 3. Examining Family Dynamics as a Mediating Variable

In the next set of analyses, I tested a series of mediation models that investigated age 15 parent warmth, parent-adolescent conflict, and family cultural conflict as three separate mediators of the association between initial (age 10) level and change in cultural orientation from age 10 – 15 and age 15 substance use outcomes. Due to the large number of models run, below I present the results for a subset of three specific outcomes, specifically SUI (continuous), past three month any alcohol use, and past three month any cannabis use. Results are organized by the particular cultural variable, with the organization designed to illustrate the convergence of results across each substance use outcome for each family relationship mediator. I provide a summary of this information in Table 27.

English use.

Greater age 10 English use level was related to greater SUI and likelihood of cannabis use via the presence of family cultural conflict at age 15 (see Table 22). This suggests that youth that more frequently use English in pre-adolescence may be at risk for substance use due to family cultural conflict in adolescence. In addition, steeper increases in English use across ages 10 – 15 were related to lower substance use risk across all measures via increased family warmth. This suggests that youth who have increasing frequency of English use may be more protected from substance use development due to having warmer relationships with their parent(s), in this case suggesting that linguistic acculturation is a protective factor. No other mediators explained the link between English use slope and substance use outcomes.

Spanish use.

Age 15 parent warmth was a robust mediator of the link between age 10 Spanish use level and substance use outcomes, with greater age 10 Spanish use linked to lower substance use outcomes via greater age 15 parent warmth (see Table 23). In addition, greater increases in

Spanish use across ages 10 – 15 were linked to lower degree of SUI and lower likelihood of any cannabis use via greater parental warmth. Furthermore, steeper increases in Spanish use were related to lower SUI and lower likelihood of any cannabis use via absence of family cultural conflict. These findings suggest that Spanish use, both initially and over time, plays a protective role against the development substance use by promoting (or eliciting) parent warmth and reducing family cultural conflict.

American cultural values (ACV).

Parent-child conflict was a consistent mediator of the relation between age 10 ACV level and substance use outcomes (see Table 24). Specifically, greater age 10 ACV was related to more problematic substance use outcomes via increased parent-child conflict. This suggests that early ACV may confer risk for substance use development, by increasing the degree of parent child conflict. In addition, steeper increases in ACV across ages 10 - 15 were indirectly related to greater likelihood of alcohol use and cannabis use (but not substance use intentions) at age 15 via lower age 15 parent warmth. Furthermore, family cultural conflict was a robust mediator, with steeper increases in ACV across age 10 – 15 linked to greater substance use risk by the presence of family cultural conflict. These findings demonstrate that lower parental warmth and increased family cultural conflict are key factors that may explain the why acculturation predisposes youth to substance use development, and therefore map on closely to what would be suggested by acculturation theory.

Traditional family values.

Greater parent warmth explained the relation between higher family values at age 10 and lower likelihood of alcohol use (see Table 25). On the other hand, family cultural conflict mediated the relations between age 10 traditional family values and age 15 SUI and likelihood of

alcohol use, with lower traditional family values associated with higher substance use risk via the presence of family cultural conflict. These findings suggest that early family values orientation may protect youth from substance use development by promoting parent warmth and reducing the likelihood of later family cultural conflict. From a developmental standpoint, greater increases in traditional family values across ages 10 - 15 was robustly linked with lower substance use risk via increased parent warmth. In contrast, steeper decreases in traditional family values were robustly linked with greater substance use risk via increased parent child conflict and the presence of family cultural conflict. These findings demonstrate the crucial role of traditional family values in conferring protection against youth substance use development, and suggest that increased parent warmth, decreased parent child conflict and the absence of family cultural conflict may each partially explain why endorsing family values lowers risk.

Mexican-American ethnic pride.

Parent-child conflict was a robust mediator of the relations between age 10 Mexican-American ethnic pride and substance use risk (see Table 26), with greater Mexican-American ethnic pride linked to higher substance use risk at age 15 via increased parent-child conflict. Parent warmth was a less consistent mediator, explaining only the link between age 10 Mexican-American ethnic pride and age 15 SUI, where greater age 10 Mexican-American ethnic pride was indirectly related to higher SUI via lower parent warmth. These findings suggest that early ethnic pride is a risk factor for substance use development, and this increased risk may be partially explained by increased parent child conflict and, to a lesser degree, lower parent warmth. The developmental results examining downstream risks of changes in Mexican-American ethnic pride were very similar to the findings for traditional family values. Specifically, steeper increases in Mexican-American ethnic pride were linked with lower

substance use risk via higher parent warmth, lower parent-child conflict, and absence of family cultural conflict. These findings suggest that enculturation, in the form of increasing ethnic pride is a protective factor against substance use development, and these benefits may be partially explained by a combination of more positive family dynamics.

Chapter 4: Discussion

Overall Project Aims

The broad goal of this dissertation was to understand substance use etiology in Mexican-origin youth in cultural and familial context. Specifically, the aims of this dissertation study were to characterize cultural orientation change over time, to link cultural orientation change with substance use etiology, and to investigate how acculturation processes might be related to substance use etiology via family relationship characteristics.

Characterizing Cultural Orientation Development Across Adolescence

The findings of this study add to the nascent empirical literature examining acculturation and enculturation as processes rather than as static variables. This study is novel in characterizing dimensions of cultural change at the measure or variable level using latent growth modeling, rather than characterizing profiles of change as in recent studies (e.g., Berkel et al., 2010; Knight et al., 2009; Knight et al., 2013; Matsunaga et al., 2010; Schwartz et al., 2013), which used growth mixture modeling (GMM) approaches. These results complement prior findings from studies using GMM by providing more nuanced information regarding the characteristics of growth trajectories for each cultural domain separately, and also by examining differences between boys and girls in growth parameters. Further, improving on studies that examined only two time points (e.g., Unger et al. 2009; Berkel et al., 2010), this study also used

five waves of data across ages 10 through 15 to better characterize the unfolding of cultural orientation processes as a developmental phenomenon.

The central findings of Aim 1 support recent theoretical propositions (e.g, Schwartz et al., 2010) that cultural orientation is not a static phenomenon, but rather a dynamic process that varies across domains and individuals. Aim 1 univariate LGMs demonstrated that there is significant degree of variation for all cultural domains assessed not just in terms of intercept (which has been long recognized and assessed in cross-sectional studies of acculturation) but also variation in how youth change over time. These findings converge with prior studies that used GMM approaches to derive unique trajectory classes (e.g., Berkel et al., 2010; Knight et al., 2009; Knight et al., 2013; Matsunaga et al., 2010; Schwartz et al., 2013) also illustrating between individual variation in youth cultural trajectories.

Moreover, the dynamic nature of cultural orientation change was supported by several significant quadratic trends demonstrating that acculturation and enculturation are non-linear developmental processes. The average quadratic effect for American cultural values is consistent with a recent study by Knight and colleagues (2013), which found a significant quadratic trend for "mainstream" American cultural values within two out of four trajectory classes, with a slower rate of decrease (i.e., deceleration) in the erosion of American cultural values over time. Overall, these findings reinforce emerging evidence (e.g., Knight et al., 2013) that developmental trajectories of some cultural orientation domains may be better approximated by quadratic trends rather than simple linear slopes. Cultural change may involve steeper changes on one hand, or stabilization on the other, depending on the cultural domain and developmental period being examined, and change may vary across individuals or subgroups. Still, quadratic trends, like linear trends, are only approximations of the underlying developmental phenomena, and caution

is warranted in interpreting quadratic trends. In particular, English use demonstrated a clear ceiling effect, with a notable portion of the population maxing out at the scale maximum of four.

Another primary finding of Aim 1 results suggests that cultural trajectories for boys and girls may look different. I found evidence that boys and girls may have different initial levels of Spanish use (with girls higher in Spanish use at age 10) and American cultural values (with boys higher in American values at age 10), although the characteristics of their change over time (i.e., quadratic trend and rates of change across ages 10 – 15) generally appeared similar. This finding suggests that girls may maintain higher levels of Spanish and have lower levels of American values, potentially due to different priorities for parental socialization (Umaña-Taylor, Alfaro, Bamaca & Guimond, 2009). However, I also found that the rate of deterioration for Spanish use and American cultural values was similar across genders suggesting that similar developmental processes occur over time for boys and girls.

More interesting was the results for ethnic pride, which suggested girls have higher initial levels of ethnic pride, and do not decrease as rapidly as boys in endorsement of ethnic pride across ages 10 – 15. This finding coincides with prior research by Umaña-Taylor, Gonzales-Backen and Guimond (2009), which also found gender differences in the development of ethnic identity, with girls having increased levels of ethnic identity exploration, resolution, and affirmation from mid- to late-adolescence, with boys only experiencing increased levels of affirmation. As proposed by Phinney (1990), females may be the "carriers of ethnic traditions" (p. 509), which would support the maintenance of ethnic pride among females compared to deterioration among males. This finding may also reflect broader gender differences in identity processes (Schwartz & Montgomery, 2002). This study appears to be the first to specifically examine and find gender differences in trajectories of ethnic pride, and these results suggest that

future research should attend to gender-specific pathways in the development of ethnic pride in adolescence. Overall, this study reinforces the notion that gender is a central organizing feature of family life and developmental processes in Latino families (Cauce & Domenech-Rodriguez, 2002).

Moreover, this study was also the first (among the few longitudinal studies examining acculturation) to examine the covariance of intercept and slope terms. Aim 1 results suggested that initial levels are associated with change over time for most cultural domains. In particular, I found that lower levels of English use at age 10 were related to steeper increases in English use over time, while greater initial (age 10) levels of American values and Spanish use were related to steeper declines over time. In quadratic models, there was also evidence of covariation between initial levels and instantaneous rate of change over time for all variables except English use. These correlations may suggest that initial levels of cultural orientation may influence how cultural domains unfold, however, there is also the possibility that the magnitude of the correlations presented in Table 10 may also reflect some degree of statistical inflation given specification of time with age 10 as the intercept (Kreft, Jan de Leeuw & Aiken, 1995; Mehta & West, 2000). The method used in this study followed practical advice by Bisaenz and colleagues (2004) which suggested that the coding of time should not be influenced by multicollinearity issues in the examination of substantive questions, though careful attention to interpretation of model estimates is still warranted.

I found that English use was the only cultural domain that demonstrated a clear average increase across ages 10 – 15, suggesting an average pattern of linguistic acculturation, and in fact there was somewhat of a ceiling effect for English use as evidenced by the quadratic model. Also, children who endorsed relatively less English use changed more drastically whereas other

children who endorsed initially high English use remained more stable in their use over time. This finding is consistent with other research documenting increasing levels of English use (or stable high levels of English use) (e.g., Knight et al., 2009), and this is logical given expectations in children's daily environments, particularly the school context, which stipulate that they learn and use English to communicate. Interestingly, American cultural values showed an average decrease over time, with an initial steep decrease followed by stabilization in mid-adolescence. This average pattern diverges from acculturation theory, which would suggest that youth should increasingly endorse American values over time. From a developmental perspective, this average trajectory is also somewhat surprising given that the American Cultural Values subscale focuses in part on independence, which should theoretically be increasing across adolescence. This finding might also be due to idiosyncrasies of the American values subscale, which Knight et al., (2010) found was positively associated with Mexican cultural values in the original scale development[3], however, a recent study by Knight and colleagues (2013) found that in two of the subgroups American cultural values increased over time, while in two groups American values decreased. Thus, it is unclear whether this finding may be attributed to unique sample characteristics, measure characteristics, or analysis methodology. Although the significant variation in slope indicates that some youth do increase in their American cultural values orientation, the finding that American values decrease on average calls into question the assumption that American cultural values will increase for most Mexican-origin youth across adolescence. Perhaps the American cultural values scale (derived from focus groups of Mexican-origin individuals) measures stereotypical American values, and in that case the average decrease

[3] Idiosyncrasies of the MACVS may be due to measure development accomplished via focus groups of Mexican-origin adults and adolescents who were asked to specify cultural values that were representative of American-culture.

in American values may represent youth becoming more aware and less approving of the cultural constraints of these prototypical beliefs.

In terms of enculturation variables, I found robust evidence that Spanish use, Mexican cultural values and traditional family values decreased on average over time, although there were idiosyncratic patterns (i.e., quadratic versus linear trend and gender differences) across language use, values, and identity domains. These findings provide support to theoretical propositions that suggest that many Mexican-origin youth may lose (or have decreasing endorsement of) elements of traditional Mexican culture over time. In addition, I found that ethnic pride may also decrease in adolescence, supporting prior research on ethnic identity exploration finding that identity exploration follows a quadratic trend, peaking in adolescence and then declining (Pahl & Way, 2006). In the current study examining ethnic pride, the decreasing trajectory that Pahl and Way (2006) found held true only for males as described above. The literature has suggested that it is the deterioration of these protective cultural elements that predispose youth to negative outcomes, for example, the loss of traditional family values found in the current study, and this finding provides a key foundation for examining the questions tested in Aims 2 and 3 related to prediction and mediation of substance use outcomes.

Predicting Cultural Orientation Across Adolescence

In addition to examining the characteristics of cultural level and change over time, I was also interested what might predict initial age 10 cultural orientation and development over time. I explored gender as an individual-level variable, family socioeconomic characteristics, including family income and mother education, and children's perceived *peer* and *combined* (teacher + peer) discrimination. Although gender multi-group models showed a number of mean differences in intercept and slope between boys and girls, results from the LGMs conditional on covariates

did not replicate gender differences. The exception to this was for Spanish use at age 10, and results supported the multi-group model suggesting that girls had higher levels of Spanish use at age 10.

Generational status appeared to be a relatively robust predictor of initial levels of cultural orientation. Increased generational status increased was associated with greater English use, American cultural values, and lower Spanish use and ethnic pride at age 10. Unexpectedly, generational status did not predict initial levels of Mexican cultural values or traditional family values, which contrasts with the original psychometric evaluation of the Mexican American Cultural Values scale by Knight and colleagues (2010), which found significantly lower scores for U.S. born youth (compared to immigrant youth) on the overall Mexican cultural values scale, as well as lower scores on several of the familism subscales. Also surprising, results suggested that generational status did not predict change over time in any cultural variables, however, it would be interesting to explore this question in a multi-group model to further assess possible generational differences in cultural change over time.

In terms of demographic factors, only mother education emerged as a predictor of cultural orientation, specifically as a predictor of American cultural orientation domains. Higher mother education was associated with greater English use at age 10. This suggests that childhood English use may be fostered more in families with higher parental education, and moreover, mother education may also be a proxy for her increased English use, years living in the U.S. or receiving education in the U.S., which would also explain this association. In addition, lower mother education was associated with higher levels of American cultural values at age 10, and steeper decreases across ages 10 – 15. This may imply that in childhood, concepts such as independence, competition and materialism are promoted more within families in which mothers

have less education, however, these factors may become less important for youth either due to decreased socialization surrounding these values, or due to personal choice. These values may become more important for youth in households with higher education potentially due to families promoting school success as youth transition into high school. This finding deserves additional attention to attempt to replicate the opposite cross-sectional and developmental effects, and also to understand factors that may explain the links between mother education and variation in levels and change of American cultural values.

Importantly, child perceived discrimination also emerged as a predictor of level and change of cultural orientation. Greater age 10 perceived *peer* discrimination was associated with higher endorsement of American values at age 10. Peer discrimination may occur more in children with more individualistic attitudes, or on the other hand, greater American cultural values may also make youth more attuned to potential discrimination experiences. Relatedly, prior study has noted that perceptions of discrimination are higher among native-born than foreign-born young Latinos (Pew Hispanic Center, 2009a), and higher orientation to mainstream culture may be related to increased risk for negative outcomes stemming from discrimination among both adults (Finch, Kolody & Vega, 2000) and adolescents (Umaña-Taylor & Updegraff, 2007), although indeed there is also evidence to contrary suggesting that greater discrimination may be associated with higher externalizing behavior when youth endorse low "Anglo" cultural orientation. Overall, this finding is intriguing and appears to be the first time the relation between discrimination and American cultural values, specifically, has been discussed in the literature. Thus, additional investigation is warranted to help clarify the role of American cultural orientation in reducing or escalate the negative effects of discrimination.

Furthermore, greater *combined* discrimination by teachers and peers at school was associated with steeper increases in Mexican cultural values, and in the more specific measure of traditional family values, across ages 10 - 15. My results coincide with prior research by Berkel and colleagues (2010), who also found that higher discrimination was associated with increased Mexican cultural values approximately two years later, controlling for time one Mexican cultural values. Discrimination experiences may be important catalysts for adolescents' exploration and understanding of their ethnic group membership (Pahl & Way, 2006), and similarly, perceived discrimination may also lead to a clarification of traditional cultural values, and particularly increased emphasis on tight family bonds, as suggested by the current results. In addition, there is increasing evidence that increased Mexican cultural orientation, including greater endorsement of Mexican cultural values, may serve as a "risk reducer", in protecting adolescents from the negative effects of discrimination (Berkel et al., 2010; Umaña-Taylor & Updegraff, 2007).

Given the importance of perceived discrimination related to substance use (Kulis, Marsiglia & Nieri, 2009; Okamoto et al., 2009), and particularly early experiences of discrimination (Unger et al., 2014), further research on mediators and moderators of discrimination to negative outcome pathways will serve to better elucidate risk and resilience processes that can be incorporated into preventive interventions. In particular, it is important to carefully measure perceived discrimination. The current study used two different measures of discrimination crafted from a range of different items derived from scales generally used with adults. The strength of this approach was to attempt to model different ways in which experiences of discrimination (e.g., peer only versus peer and teacher) may influence cultural growth parameters. Additional factor analysis work on these items, as well as examination of other measures of discrimination is important to further examine how different discrimination

experiences (different perpetrators—e.g., peers versus adults—and different contexts—e.g., school versus other settings) may influence the development of Mexican-origin youth. Furthermore, prior studies have suggested the importance of examining parent cultural orientations as another factor that may moderate the associations between adolescent discrimination experiences and outcomes (Delgado, Updegraff, Roosa & Umaña-Taylor, 2011), and also indicated the importance of understanding ethnic socialization as a precursor to the growth of ethnic identity and Mexican cultural values (Berkel et al., 2010; Umaña-Taylor, Alfaro, Bamaca & Guimond, 2009). Additional research in these domains will serve to better understand important pathways linking discrimination experiences to negative outcomes.

Linking Cultural Orientation Levels and Change with Substance Use Risk

A great deal of prior work has sought to understand associations between cultural orientation and risk behavior, including substance use outcomes, however, the vast majority of this work has been cross-sectional with youth of different ages. Cross-sectional research of this type can simply assess links between cultural orientation *level* and substance use, however, this research has failed to address fundamental theoretical propositions suggesting that variation in cultural *change* is the fundamental driver of differential risk for substance use. More recently, research has begun examining this question in a longitudinal fashion using GMM (Matsunaga et al., 2010; Schwartz et al., 2013) or cross-lag panel approaches (Unger et al., 2009). However, this research has several possible shortcomings, including lack of attention to separately examining unique acculturation and enculturation domains, disentangling effects of cultural level versus cultural change, and dividing of cultural trajectories into discrete GMM classes.

Results from Aim 2 linking cultural level at age 15 and change from age 10 to 15 with substance use risk provided a number of insights. English use emerged as a robust predictor of

substance use risk. Supporting prior cross-sectional research (e.g., Marsiglia, Kulis, Hussaini, Nieri & Becerra, 2010), greater age 15 English use was related to greater degree of substance use intentions and, with a particularly strong effect, degree of alcohol use intensity. My findings suggests that English use is indeed a robust cross-sectional marker of the degree of substance use risk in adolescence. Furthermore, I also found tenuous evidence that greater English use at age 15 may be related to lower likelihood of any alcohol or cannabis use. The confidence bands suggested these estimates were imprecise, thus, less credence is given to these findings. More importantly, my results also consistently demonstrated a large protective effect for English use growth where steeper increases in English use were related to lower degree of substance use risk, both in terms of degree and likelihood of use/intentions, implying that those who are developing their English use more over time are at lower risk. This finding was also seen in the parallel process growth model (PPGM), where youth with lower degree of change in English use had concurrent increasing risk of SUI likelihood over time. This effect somewhat contradicts acculturation theory (and prior cross-sectional research that has erroneously interpreted positive correlations within a single time point (e.g., Marsiglia et al., 2010)) in implying the development of English use is related to greater risk. Although other researchers have suggested that greater use of English may reflect integration with risky peer groups, changing substance use norms, these findings suggest that those with the fastest development of English use may not be entering into other environments that promote substance use risk, or at least, may have other factors (e.g., IQ) that reduce risk. In fact, it may be that youth who already have higher levels of English use in childhood (youth who were linguistically acculturated early in life), are most at risk, while those who are increasing their use in adolescence have other protective factors. Overall, these

findings reflect the key importance of adopting longitudinal designs to study the effects of the acculturation process on adolescent substance use development.

The findings for American cultural values were somewhat mixed, as most effects were small and/or inconsistent across substance use outcomes. On one hand, I found relatively robust evidence that there was a moderate to large protective effect of maintaining (rather than decreasing) in American cultural values over time as related to lower alcohol use intensity. On the other hand, I found that strong evidence that maintenance (i.e., steeper slope) of ACV was associated with concurrent increases in the likelihood of having any substance use intentions over time, and somewhat more tenuous evidence (based on the confidence interval) that greater ACV slope was associated with higher probability of any SUI. I was more confident in the finding suggesting that greater age 15 ACV was associated with a small risk effect for any cannabis use. Taken together, it appeared that maintaining ACV into adolescence may be protective against actual alcohol use, while at the same time, associated with increasing risk of having any substance use intentions, and partialling out change over time, higher ACV at age 15 still increased risk for cannabis use.

The protective effect of maintaining American cultural values may initially be surprising, since greater acculturation is traditionally considered to be related to increased risk, however, more recent bidimensional conceptualizations of cultural orientation have asserted that orientation towards American culture may not be problematic as long as one's heritage culture is maintained (e.g., Schwartz et al., 2013). Although bicultural orientation was not directly addressed in the current study, it may be that the protective effect of increasing American values as related to alcohol use intensity may be exerted primarily in those youth who are also maintaining a higher degree of Mexican cultural values over time. This finding may also be a

function of measurement issues with the Knight et al. (2010) Mexican American cultural Values scale (MACVS), since there are significant cross-sectional associations between the Mexican and American cultural values subscale scores both in the original development study and in the current study. These results may also reflect something about values development and clarification that is important, as Mexican-origin youth may be required to differentiate or integrate both Mexican and American cultural values across mainstream and culture of origin contexts (Daniel et al., 2012). Finally, the apparent contradiction in protection via increased slope and risk via higher levels at age 15 may be a function of specifying the intercept at age 15 to focus on cross-sectional effects. It may be that partialling out slope effects changes the substantive interpretation of the intercept factor. Additional research, and a focus on measurement, analytic strategy, and broader assessment of values in developmental context is needed to clarify and contextualize the protective features of American cultural values

In terms of enculturation domains, there was limited support for effects of Spanish use level and change on substance use risk. Most notably, most Spanish point estimates appeared to be close to zero, although further sampling might uncover small effects as indicated by the confidence intervals. Surprisingly, there was tenuous evidence of a moderate risk effect for increased slope of Spanish language use on alcohol use intensity, while greater age 15 Spanish use exerted a protective effect on alcohol use intensity. These effects may again be due to the specification of intercept at age 15, and further study is warranted. The findings for Mexican cultural values provided more clarity. There were robust protective effects (moderate to large in magnitude) of greater MCV slope, such that increased slope, or maintenance of Mexican heritage values were associated with lower degree of age 15 SUI and alcohol use, and lower risk of having any SUI. There was also tenuous evidence that maintenance of MCV was related to lower

risk of cannabis use. The protective effect seen for Mexican cultural orientation is consistent with prior theory and research suggesting that the maintenance of heritage culture values is associated with reduced risk for substance use (Unger, 2014). At the same time, I found tenuous evidence suggesting that, controlling for slope of MCV, higher age 15 MCV was related to greater risk of any cannabis use. This effect was imprecise as based on the confidence interval, thus I gave less credence to this estimate. Although there is a small chance that higher age 15 MCV is more risky, overall, the weight of the evidence suggested that maintaining MCV is an important protective factor. Similarly, there appeared to be strong evidence for a large protective effect of family values slope, such that maintenance of family values over time was associated with lower degree of alcohol use intensity. Although more tenuous based on the confidence interval, there was evidence for a protective effect of maintaining family values over time as related to lower degree of SUI, and evidence of a risk effect for age 15 family values as related to higher alcohol use intensity. Taken together, the strongest evidence from these results implied that the maintenance of traditional family values play an important protective role, which coincides with a strong body of evidence for this effect in prior literature.

Finally, the effects of MAEP were large in magnitude and generally consistent across substance use outcomes, however, the results are tenuous because of the width of the confidence intervals for point estimates that I obtained. Evidence suggests that there may be reason for further investigation of the maintenance of ethnic pride as a protective factor, with increased slope of ethnic pride related to decreased levels and likelihood of substance use in most cases. On the other hand, there may also be reason to investigate whether greater age 15 MAEP exerts a risk effect for substance use outcomes. As with family values and MCV, the interpretation of the intercept effect may be more nuanced since my models are partialling out how youth have

changed over time. Still, these effects for ethnic pride on substance use outcomes are novel and intriguing, warranting further study of these associations over time.

These results suggest that it may be particularly important to use modern methods for count and zero-inflated count data to appropriately specify substance use outcome distributions found in an adolescent community samples. Acculturation researchers often have dichotomized highly skewed substance use outcome variables (e.g., Marsiglia et al., 2012,Marsiglia & Waller, 2002), performed mathematical transformations (e.g., Allen et al., 2008; Fosados et al., 2007; McQueen, Getz & Bray, 2003) or did not address the non-normal characteristics of the data (e.g., Marsiglia et al., 2010), negating the opportunity to use modern zero-inflated methods appropriate for these types of data. My models showed that it was quite important to consider both the degree of substance use risk and the likelihood. When the models were specified using a zero-inflated negative binomial model which partialled out count and logistic processes, in general, larger associations emerged between cultural predictors and logistic portions of the model. This was also true when comparing substance use intentions with a continuous specification versus as a pseudo count. Zero-inflated methods allow researchers to disentangle the development of any use/intentions versus the progression (i.e., degree) of substance use/intentions. Still, associations were generally less consistent and lower in magnitude in predicting likelihood, and it may be that other factors, including sensation seeking (Wilkinson, Shete, Spitz & Swann, 2011), and peer and family processes (Parsai, Marsiglia, Kulis & Nieri, 2009; Voisine et al., 2008) are directly associated with the likelihood of use, while cultural domains may be more strongly associated with degree of use. These findings reflect an important methodological opportunity for contemporary acculturation research to improve the modeling of substance use and risk behavior outcomes. Incorporation of modern methods will bolster the study of acculturation and substance

use in adolescence by more clearly distinguishing substance use as a developmental process involving initiation and progression over time.

An additional example of the use of contemporary methodology in the current study is the use of parallel process growth modeling (PPGM) to examine the convergence of cultural change with changes in the likelihood of substance use intentions. In my reading of the literature this represents the first time that research has used PPGM to address longitudinal changes in culture and changes in substance use risk, which addresses fundamental questions in the literature heretofore only addressed with cross-sectional research. In my PPGM results, I found that steeper increases in English use, traditional family values, and Mexican-American ethnic pride were each related to slower increases in the likelihood of any substance use intentions. These results coincide with prior research and theory suggesting that enculturation (i.e., Mexican values generally, and traditional values specifically, as well as ethnic pride), or the maintenance of cultural bonds, is protective against substance use risk. However, these findings are again surprising in suggesting that more rapid acculturation, in terms of English use, may be protective in terms of substance use risk. Steeper increases in American cultural values, on the other hand, were related to increased likelihood of any substance use intentions. This finding is in the opposite direction from the age 15 alcohol use intensity model (suggesting greater increases in ACV were related to lower age 15 alcohol use intensity), and falls in line with what would be expected from theory in that more rapid acculturation to American cultural values is a risk process as related to substance use development.

In addition, PPGMs also provided tests of the associations between changes in cultural orientation and likelihood of SUI at age 15. I found that steeper increases in English use were related to higher likelihood of any SUI, while steeper increases in American cultural values and

Mexican-American ethnic pride were related to lower age 15 SUI likelihood. The findings for English use and ethnic pride follow predicted patterns of acculturation as risk factor and ethnic identity development as a protective factor, while the finding for American cultural values was somewhat surprising. Interpretation of these findings is a complex undertaking, and it may be that the conditional effects require additional steps for understanding associations (see Atkins et al., 2012), which might suggest alternative interpretation. Future work with these results with probe concurrent associations between slopes, along with associations between the slope of culture with intercept of any SUI at age 15.

One significant issue was that of missing data. Across age 15 SUI, alcohol use and cannabis use, missing data ranged from 40-45%. Unfortunately, this degree of missingness could have attenuated parameter estimates during maximum likelihood estimation. This is a key limitation in the current study, and additional follow-up with this data will specify the data by wave (rather than age) to have better coverage for substance use outcomes.

One factor that was not addressed in the current study was the possible moderating role of gender in the relation between cultural orientation processes and substance use outcomes. Prior evidence has suggested that the relation between cultural orientation and substance use may differ between boys and girls (e.g., Fosados et al., 2007; Kulis et al., 2010; Marsiglia, Kulis, Hussani, 2010; Marsiglia et al., 2011; Schwartz et al., 2013; Wahl & Eitle, 2010). The role of gender in accentuating the relation between cultural orientation and substance use risk may depend on the dimension or acculturation strategy being examined, and the examination of other conditioning factors such as parental monitoring (e.g., Marsiglia et al., 2012) or generational status (Wahl & Eitle, 2010). Future steps with the current data will examine whether the

development of cultural orientation over time may be more strongly linked to substance use for boys compared to girls.

Family Relationship Characteristics as an Explanatory Mechanism Linking Cultural Orientation and Change with Substance Use Risk

Theory (e.g., Szapocznik & Kurtines, 1993) and research (e.g., Gonzales et al., 2006) suggest that disrupted family dynamics mediate the relation between cultural orientation and outcomes. There are a number of cross-sectional studies that have examined this mediation pathway (e.g., Gil, Warner & Vega, 2000; McQueen, Getz & Bray, 2003; Mogro-Wilson, 2008), and more recent studies have investigated this question with longitudinal data (e.g., Updegraff et al., 2012; Prado et al., 2009), although these prior longitudinal studies did not examine cultural change specifically. The current study is one of two longitudinal studies (the other being Schwartz et al., 2013) investigating the indirect effects of cultural *change* on substance use risk and behavior indices via disrupted family relationships. This study supplements Schwartz and colleagues' use of GMM that classified individuals into cultural trajectory groups (combining across cultural domains) with the current LGM procedures, which focused on individual cultural domains and used greater variation in cultural parameters (rather than class membership) to predict mediators and outcomes. At the same time, the complementary utility of LGM within an SEM framework assumes a normal distribution of random effects, which may or may not be an accurate way to consider these effects if they can be clearly divided into subgroups of growth trajectories. Ultimately this is an empirical question. In addition, Schwartz et al. examined diverse sample of Hispanic adolescents consisting mainly of youth from Cuban and various central American national backgrounds, while the current study focused specifically on Mexican

American youth. Finally, I utilized a much larger sample size ($N = 266$ in Schwartz study compared to $N = 674$ in current study).

Results from the current study suggested robust mediation pathways between cultural orientation change and substance use risk facilitated via parent warmth, parent-child conflict, and family cultural conflict. As predicted, increased parent-warmth at Wave 5 (controlling for earlier Wave 1 levels of parent warmth) was associated with reduced substance use risk, while increased parent-child conflict and the presence of family cultural conflict was related to greater substance use risk. Family relationship characteristics were strongly supported as mechanisms that may explain differential risk for substance use in relation to level and change in cultural orientation. However, in some cases mediation pathways appeared unique such that specific domains of cultural orientation were related to substance use risk via specific family relationship mechanisms.

For example, steeper increases in English use were related to reduced substance use risk via a unique pathway of increased (child perception of) parent warmth. This suggests that increased warmth may be a key feature of families in which children are learning English more rapidly, protecting youth from substance use risk. Although this finding may initially seem surprising given that greater acculturation is related to lower risk, it makes sense when considering that those youth who have higher levels of English use at baseline (and thus, are already acculturated in the language domain), may experience reduced levels of parent warmth, in turn, predisposing youth to substance use and intentions. Moreover, those youth who had initially high levels of English use at age 10 also had increased likelihood of experiencing family cultural conflict, which in turn predicted increased substance use risk. This implies that reduction

of family cultural conflict is a particularly important target in preventive interventions for families with children who have high levels of English language use in childhood.

For American cultural values, the other acculturation domain, steeper increases in were related to greater substance use risk via decreased experience of parental warmth, and greater likelihood of experiencing any cultural conflict. It may be that youth who increasingly agree with values regarding independence, materialism and competition create distance between themselves and their parents who adhere to traditional values of interdependence and strong family bonds. Youth who decrease their endorsement, or increasingly reject American values over time, may experience convergence in values with their parents and resulting maintenance of protective positive family relationships. Yet, there was also relatively robust evidence that, controlling for degree of change from age 10 – 15, youth with higher levels of American cultural values at age 10 had decreased substance use risk via lower conflict with their parents. It is unclear why early American values may be protective in this case. It may be that early values of independence, competition and materialism are encouraged in these Mexican-origin families, while a strong maintenance of these values over time may be less adaptive as youth mature. Still, it may also be that youth initially high in American cultural values are bicultural with strong endorsement of protective Mexican cultural values (e.g., familism) (unfortunately, biculturalism is something that was not directly addressed in the current study), which may counterbalance typically negative effects of American cultural values. Overall, this counterintuitive finding reinforces the notion that the pathways linking cultural orientation to substance use risk via family relationships may be complex, and further study of this pathway is warranted.

Moving onto enculturation domains, greater initial levels and steeper increases over time of Spanish use were related to reduced substance use risk via high levels of parental warmth.

This finding suggests that maintaining warm family relationships may be a key benefit of maintaining heritage Spanish language, likely due to improved communication and cultural bonds between parents and children. Furthermore, child maintenance of Spanish use over time also appears to be related to decreased substance use risk via lower likelihood of family cultural conflict. Although not directly tested in the current study, prior research has suggested that youth who successfully adapt to dual cultural pressures of English language use and American cultural practices outside of the home, while maintaining Spanish use and Hispanic cultural practices at home, are likely better able to effectively navigate cultural demands in the family (Coatsworth, Maldonado-Molina, Pantin & Szapocznik, 2005; Sullivan et al., 2007). These findings suggest that interventions promoting the maintenance of heritage language use may have indirect effects on the reduction of substance use by maintaining family warmth and reducing cultural conflict.

Interestingly, robust mediation pathways involving changes in youth's endorsement of traditional family values and Mexican-American ethnic pride appeared to operate in similar fashion. Specifically, maintenance (i.e., steeper increases) of traditional family values and ethnic pride were related to reduced substance use risk via maintenance of parent warmth, lower parent-child conflict, and lower likelihood of family cultural conflict. These findings support prior research (e.g., Unger, Ritt-Olson, Soto & Baezconde-Garbanati, 2009) suggesting that the maintaining heritage cultural values and identity has a multitude of beneficial effects on family relationships, and this may be particularly true in families in which parent's strongly endorse heritage culture values. These beneficial effects of maintaining heritage culture, and particularly family values, may not only improve family relationships but also buffer youth from deviant peers (Germán, Gonzales & Dumka, 2009). On the other hand, it may be that immigrant parents may have difficulty managing or relating to youth who have distanced themselves from the

families' cultural heritage (Smokowski & Bacallo, 2011). Interventions that promote the maintenance of traditional family values and identity may not only provide a culturally relevant framework for working with Mexican-origin families, but also address a key precursor to disrupted family relationships.

Limitations of the Current Study

The current study had a number of potential limitations that must be considered. First, the cultural measures used in this study may not fully assess the dynamic nature of cultural orientation domains. In particular, using combined Mexican and American cultural values scores, which averaged across several sub-domains of values, may be insensitive to specific effects of those individual sub-domains (e.g., familism versus traditional gender roles). I attempted to limit the effect of combining across Mexican cultural values domains by also using a measure of traditional family values derived from and highly correlated with the Mexican values scale, and used the Knight MACVS scale which has previously been validated, and used in an prior longitudinal study (Knight et al., 2013). However, I did combine across sub-domains of American cultural values, thereby limiting my ability to interpret specific effects of independence, materialism, and competition. More recent study of cultural orientation has emphasized the importance of examining multiple domains of cultural orientation as linked to substance use, and I did not address key cultural domains such as fatalism, machismo or marianismo (Soto et al., 2011), or traditional gender role attitudes (e.g., Kulis, Marsiglia & Hurdle, 2003; Updegraff et al., 2014). Further study should carefully balance measurement efficiency with rigor in order to accurately estimate general and specific influences of various cultural domains. Further, the current study only considered several facets of family relationships, and did not include parenting characteristics, such as monitoring/knowledge or

inconsistent discipline (e.g., Samaniego & Gonzales, 1999). Additional evaluation of diverse family mechanisms is an important area of further study.

Another key limitation in the current study was that I did not directly bidimensional cultural orientation development. Ideally I would have been able to test the joint associations of acculturation change and enculturation change with substance use. Growth mixture modeling has this as a relative strength (since you can say, for example, this class is increasing in Americanism and decreasing in Mexican orientation), whereas I would have need to modeled these as separate growth processes and correlated them both with outcomes of interest. In that sense, I did not *simultaneously* assess bidimensional cultural orientation. Prior studies that have utilized a GMM approach have more adequately tested bidimensional cultural orientation over time (e.g., Knight et al., 2013; Losoya et al., 2008; Schwartz et al., 2013). This is counterbalanced by the intention of the current study to use LGM methodology to examine variation in specific cultural domains (rather than combining across domains and then dividing into discrete cultural trajectory profiles), to predict family relationship characteristics and substance use risk. Although the LGM approach does provide a nice complement to GMM by separately examining cultural variables, given the theoretical and empirical importance of bidimensional cultural orientation trajectories it is important to supplement the current work with other types of methodology, including GMM and PPGMs, which will allow for concurrent modeling of Mexican and American cultural orientation. Furthermore, the current LGM procedures within an SEM framework assumed a normal distribution of random effects, which may not be an accurate way to consider these effects if they for discrete subgroups of growth trajectories. Ultimately, it is important to empirically compare the utility of LGM growth parameters to GMM class membership in terms of most effectively and efficiently predicting substance use outcomes of interest.

Another key issue that was not addressed in the current study was that of parent-child cultural orientation dynamics, and specifically the possibility of emerging cultural orientation differences into adolescence. A great deal of prior research has noted the importance cultural orientation not just as an individual phenomenon, but as a family-level attribute, with differences in cultural orientation related to a number of different outcomes via disrupted family relationship characteristics and parenting practices (e.g., Marsiglia et al., 2009; Martinez, 2006; Schwartz et al., 2012; Telzer, 2010). Clearly, including parent cultural orientation to longitudinal approaches introduces another layer of complexity to statistical modeling procedures, perhaps explaining why this type of study has not yet been completed. Yet this type of approach is of obvious importance to fully address key theoretical propositions suggesting that disrupted family dynamics emerge not just from individual child acculturation or enculturation processes but also from differential acculturation/enculturation between family members.

Challenges arising from missing data when the data were sorted by age were potentially more serious in terms of interpreting the current results. Due to idiosyncrasies of data collection (e.g., heterogeneity of data collection within waves; administration of cultural values, ethnic pride, and family relationship measures at every other wave, rather than every wave like English and Spanish use, and substance use outcomes; English and Spanish use measures not administered to subgroup of youth at Wave 2), there was significant data missingness in Aim 2. Although this problem was likely less influential in estimating English use and Spanish use growth curves, observed data for cultural values and ethnic identity across ages was approximately one-half to one-third of the full sample size (N = 674), potentially reducing accuracy and generalization of estimates even with the use of maximum likelihood methods. More problematic was the significant degree of missingness in Aim 2 for substance use

outcomes at age 15 with up to 45% missingness. Although I chose to present the analyses in their current format in order to continue with more strictly developmental approach, I addressed this problem by changing my approach in Aim 3 to use the data organized by wave. Going forward, I plan to investigate other ways to model these data to better account for the heterogeneity of measurement/age at each wave (Aydin, Leite, Algina, 2014), and reduce the impact of missing data as part of the LGM approach with data organized by age.

The current study also used observed means for cultural indicators rather than fully latent growth models, which resulted in growth curve parameters that were not "error free" and that assumed (possibly incorrectly) measurement invariance. This approach may have led to attenuated estimates of model parameters, in addition to potentially masking important differences in response styles conditioned by age or even language use (Knight & Zerr, 2010; Schwartz et al., 2014). The use of full latent models, testing for measurement, or using other contemporary methodology such as latent difference score methods (e.g., Grimm, An, McArdle, Zonderman & Resnick, 2012; McArdle, 2009; McArdle & Hamagami, 2001) suggest not only the potential of longitudinal methodology, but also the complexity of these statistical models. Contemporary researchers are best served when they are well versed in the assumptions, limitations, and relative strengths of different longitudinal methodologies.

The current study is also limited in not achieving temporal precedence in testing mediation pathways. Due to missing data characteristics, I was forced to organize data by wave, and because of the main focus of examining variation cultural *change* rather than just earlier cultural levels, I had to specify growth curves from Wave 1 to Wave 5 with both family relationship characteristics and the substance use outcomes of interest specified at Wave 5. Ultimately, this study falls short of the temporal precedence achieved in the prior longitudinal

mediation study by Schwartz and colleagues (2013). However, it may be that I am able to use additional CFP data from recently collected Wave 6 to achieve temporal precedence with outcomes specified later than mediators.

A final limitation recognized in the current study, is that these results should not be assumed to operate in the exact same fashion across other Latino subgroups or even within the Mexican-origin population due to subgroup and within-group variation. For example, prior research has found that certain associations or pathways with respect to cultural and familial processes may differ between Cubans and Central Americans in Miami and Mexican-origin individuals in Los Angeles (Schwartz et al., 2012). Furthermore, other prior studies have also found that associations between cultural processes and family characteristics differ between Mexican-origin individuals in Los Angeles and those in North Carolina, potentially due to variation in receiving contexts or socioeconomic characteristics (e.g., Potochnick, Perreira & Fuligni, 2012; Yahirun, Perreira & Fuligni, 2013). This prior research supports the fact that additional attention should be devoted to the heterogeneity within the Latino population generally, and Mexican-origin specifically.

Strengths of the Current Study

At the same time, there were a number of strengths in this study. The primary strength of the current study was the relatively innovative use of a longitudinal design to explicitly study acculturation as a dynamic within-person *process* rather than static between-individual difference variable. In particular, this study employed LGM procedures to study unique characteristics of cultural orientation domains over time. Because acculturation is theorized to be a developmental process, the analysis of data at multiple time points and the employment of sophisticated statistical analysis techniques (e.g., latent growth curve analysis; parallel process growth

modeling) will continue to move the field forward. Furthermore, this study is one of only two studies to test mediation within a longitudinal framework in order to examine pathways linking cultural *change* (and early *levels* of cultural orientation) to substance use risk via disrupted family relationship characteristics. In utilizing longitudinal methodology in this manner, this study served to examine theoretical processes that have been discussed (e.g., Szapocznik et al., 1978; Szapocznik & Kurtines, 1993) and inferred from cross-sectional data for over thirty years but have only recently been directly tested in the literature (Schwartz et al., 2013).

The current study was framed using a contemporary theoretical conceptualization of acculturation as a bidimensional process involving the potential change within multiple domains of cultural identity (Schwartz et al., 2010). As other previous studies have neglected this bidimensional multi-faceted nature of acculturation, this study sought to bridge this divide by employing multiple specific measures of cultural practices (i.e., language use), values, and identity (i.e., ethnic pride) domains across acculturation (i.e., American) and enculturation (i.e., Mexican) cultural dimensions as recommended by venerable acculturation researchers (e.g., Unger & Schwartz, 2012). Although this study does have measurement questions, it still improves upon other research that has problematically dichotomized culture and relied on proxy variables (e.g., Warner, Fishbein & Krebs, 2010). Other strengths of the current study include the large sample size, and the use of zero-inflated count data techniques to more appropriately specify underlying distributions of substance use outcomes.

Future Directions

This dissertation has continued building the nascent foundation for longitudinal research on the acculturation and enculturation processes. Future research may employ similar paradigms to study the relation between acculturation change and other forms of adjustment, including

mental health problems, drug use and polysubstance use, sexual risk behavior and academic achievement. Researchers should address the need for additional theoretical work, such as the need to clearly delineate expectations for how cultural development should be expected to unfold over time and what factors may predict change, the need for empirical studies carefully measuring developmental acculturation and enculturation processes.

As described briefly above, future studies should also carefully develop and examine competing hypotheses about whether it is adolescent acculturation, average family level acculturation, or differential acculturation that matters in relation to youth adjustment issues. It is also important to carefully define and measure cultural orientation domains, while developing innovative measures of cultural practices, values and beliefs, as well as cultural context, such as Schwartz and colleagues' recent development of a measure of American identity measure (Schwartz, Park et al., 2012), and a measure of the characteristics of immigrant receiving context (Schwartz et al., 2014).

In addition, the current research explicitly examined only two systems (i.e., family and culture) within the many layers of influence on adolescent adjustment, and there are many other influences to consider within a bioecodevelopmental framework (Bronfenbrenner, 2005). There is much important work to do in order to build the empirical literature linking cultural processes to negative outcomes via the wide range of putative psychosocial mechanisms at the individual, family, peer, school and community level. Researchers in this area should more explicitly examine the initiation and progression of substance use, and in doing so, link the developing acculturation literature with the broader literatures on the etiology and development of alcohol, tobacco and other drug use (e.g., Sher, 1991; Wills, Sandy & Yaeger, 2000). Future study with the current sample will provide more insights into risk pathways for mid- to late-adolescence, a

key developmental period for the onset of substance use problems (Brown et al., 2008). In particular, it is important and novel to examine the relation between cultural orientation with personality factors such as impulsivity and related higher-order executive functions (Dawes et al., 2000; Sher, 1991; Tarter, 1988; Tarter et al., 2004; Thatcher & Clark, 2010; Wills, Sandy & Yaeger, 2000), and ways that these factors might interact to influence substance use.

To accomplish these key tasks, researchers will need to appropriately utilize advanced methodological tools, including longitudinal methodology such as Latent Growth Modeling, Parallel Process Growth Modeling, Latent Difference Score modeling, and Growth Mixture Modeling and Latent Transition Analysis, appropriate outcome specification via count and zero-inflated count methods, and modern methodology for mediation. A greater understanding of cultural and familial processes in developmental context is surely possible with additional conceptual and methodological rigor.

Clinical Significance

Demographically, Mexican-origin youth are a growing segment of the U.S. population with higher risk for early substance use initiation and disproportionate contextual risk. There are few culturally relevant prevention and intervention programs that target Latino youth substance use and its precursors (Kumpfer, Alvarado, Smith, & Bellamy, 2002; Martinez, Eddy, & DeGarmo, 2003), however, evidence is steadily increasing for the efficacy and effectiveness of culturally-relevant interventions and preventative programs that place particular emphasis on Latino adolescents and their families, such as Brief Strategic Family Therapy (Santisteban et al., 2003; Szapocznik & Williams, 2000), *Familias Unidas* (Coatsworth, Pantin, & Szapocznik, 2002), and Bridges to High School (Gonzales et al., 2012).

These findings support the longstanding focus on family-based prevention and intervention programs for Latino families in general, and Mexican-origin families specifically, that target family relationship processes in cultural context (e.g., Coatsworth, Pantin & Szapocznik, 2002; Gonzales et al., 2012; Santisteban et al., 2003; Szapocznik & Kurtines, 1993). Extrapolating from the results of the current study, family intervention is a very salient target for clinicians. Clinicians should conduct assessment of cultural orientation domains and attempt to understand developmental trajectories of acculturation and enculturation within family members. Clinicians should target not only specific family processes, such as child experience of parent warmth, parent-child conflict, and family cultural conflict specifically, but they should also address underlying cultural tensions elicited by competing demands between traditional heritage culture and mainstream American cultural arising from family and community pressures. Clinicians can specifically promote the maintenance of protective elements of heritage culture within families, such as Spanish language use, traditional family values, and ethnic pride, while also promoting adaptive responses to environmental demands via cultural frame switching. Ideally, leveraging these relevant ethnic domains will not only serve to increase cultural awareness and sensitivity, thereby promoting engagement and retention, but also to enhance the effectiveness of clinical intervention with Mexican-origin families.

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Table 1. *Participant Characteristics*

Variable	Reporter	*N*	*Frequency*	*Mean*	*SD*	*Range*
Child Gender	Child	674	50% Female			
Age at Wave 1	Child	668		10.40	0.61	9-12
	Mother	661		36.77	5.92	26-57
	Father	432		39.42	6.08	27-65
Generational Status	Child	660	1st= 28% 2nd = 61% 3rd =9%			
Nativity	Mother	665	Mexico = 84% U.S. = 16%			
	Father	432	Mexico = 89% U.S. = 11%			
Years in U.S. (Immigrant Parents only)	Mother	554		13.19	7.23	0-50
	Father	385		17.28	7.32	1-47
Family Income	Mother	603		*Med*.= $32,500	$15,000	<$5,000 - >$95,000
Mother Education	Mother	645		9.35	3.66	0-18
Child Siblings	Child	669		2.16	1.26	0-9
Child Interview Language	Child	621	English = 83% Spanish = 17%			
Perceived Discrimination (Peer)	Child	662		0.03	0.12	0-1
Perceived Discrimination (Combined)	Child	663		0.02	0.08	0-1

Note: *SD* = Standard deviation.

Table 2. *Discrimination Items*

	Item Text
Dimension 1	*Peer Discrimination*
Item 1	You have heard kids at school making jokes or saying bad things about [Mexicans/Mexican-Americans].
Item 2	Kids at school think bad things about [Mexicans/Mexican-Americans].
Item 3	Kids at school dislike [Mexicans/Mexican-Americans].
Dimension 2	*Combined (Teacher + Peer) Discrimination*
Item 4	Your teachers dislike [Mexicans/Mexican-Americans].
Item 5	You have heard your teachers at school making jokes or saying bad things about [Mexicans/Mexican-Americans].
Item 6	How often have kids at school excluded you from their activities, like not inviting you to go out with them, not inviting you to their houses, or not letting you join their games, because you are [Mexican/Mexican-American]?
Item 7	How often have you had to work harder in school than White kids to get the same praise or the same grades from your teachers because you are [Mexican/Mexican-American]?
Item 8	Have kids at school called you names because you are [Mexican/Mexican-American]?

Table 3. *Descriptive Statistics for Cultural Variables by Age*

	Age	*N*	*Min.*	*Max.*	*Mean*	*SD*
English Use	10	222	1.80	4.00	3.29	0.54
	11	497	1.20	4.00	3.35	0.51
	12	417	1.80	4.00	3.44	0.47
	13	541	1.80	4.00	3.47	0.48
	14	556	1.40	4.00	3.51	0.49
	15	407	1.00	4.00	3.55	0.46
American Cultural Values	10	221	1.42	3.93	2.53	
	11	363	1.29	4.00	2.50	0.53
	12	252	1.38	3.69	2.45	0.51
	13	335	1.36	4.00	2.33	0.46
	14	230	1.31	3.57	2.34	0.47
	15	362	1.36	4.00	2.35	0.43
Spanish Use	10	222	1.00	4.00	2.63	0.72
	11	497	1.00	4.00	2.54	0.71
	12	417	1.00	4.00	2.57	0.72
	13	541	1.00	4.00	2.45	0.72
	14	558	1.00	4.00	2.44	0.76
	15	407	1.00	4.00	2.46	0.73
Mexican Cultural Values	10	222	2.50	4.00	3.48	0.30
	11	366	2.39	4.00	3.43	0.30
	12	253	2.39	4.00	3.41	0.33
	13	335	2.08	4.00	3.34	0.32
	14	231	2.08	4.00	3.27	0.37
	15	362	1.75	3.97	3.23	0.34
Family Values	10	222	2.58	4.00	3.64	0.30
	11	366	2.50	4.00	3.60	0.29
	12	253	2.46	4.00	3.60	0.31
	13	335	2.25	4.00	3.57	0.31
	14	231	2.25	4.00	3.51	0.37
	15	362	1.92	4.00	3.48	0.33
Mexican-American Ethnic Pride	10	221	2.00	4.00	3.55	0.42
	11	365	2.00	4.00	3.54	0.44
	12	251	1.71	4.00	3.59	0.46
	13	334	1.71	4.00	3.58	0.46
	14	229	1.00	4.00	3.51	0.52
	15	363	1.71	4.00	3.48	0.51

Note: *SD* = Standard Deviaion.

Table 4. *Descriptive Statistics for Cultural Variables by Wave*

Variable	Wave	*N*	*Min*	*Max*	*Mean*	*SD*	*α*
English use	1	640	1.20	4.00	3.31	0.53	.74
	2	311	2.20	4.00	3.42	0.47	.71
	3	576	1.80	4.00	3.48	0.47	.74
	4	589	1.40	4.00	3.46	0.50	.76
	5	603	1.00	4.00	3.55	0.46	.76
Spanish use	1	640	1.00	4.00	2.58	0.71	.80
	2	311	1.00	4.00	2.52	0.70	.83
	3	576	1.00	4.00	2.51	0.73	.83
	4	590	1.00	4.00	2.41	0.74	.83
	5	604	1.00	4.00	2.47	0.73	.83
American Cultural Values	1	635	1.29	4.00	2.52	0.54	.82
	3	574	1.36	4.00	2.35	0.47	.80
	5	604	1.29	4.00	2.35	0.44	.78
Mexican Cultural Values	1	639	2.39	4.00	3.46	0.30	.87
	3	576	2.08	4.00	3.35	0.33	.89
	5	604	1.75	3.97	3.24	0.35	.91
Traditional family values	1	639	2.50	4.00	3.62	0.29	.85
	3	576	2.25	4.00	3.57	0.32	.89
	5	604	1.92	4.00	3.49	0.35	.90
Mexican-American ethnic pride	1	636	2.00	4.00	3.55	0.43	.75
	3	573	1.00	4.00	3.57	0.48	.85
	5	605	1.43	4.00	3.50	0.50	.86

Note: *SD* = Standard Deviaion. *α* = Cronbach's alpha.

Table 5. *Descriptive Statistics for Relationship Variables by Wave*

	Wave	*N*	*Min*	*Max*	*Mean*	*SD*	*Frequency*	*Cronbach's α*
Mother - child conflict	1	666	0.00	3.00	0.45	0.41		.75
	5	604	0.00	2.88	0.52	0.48		.89
Father - child conflict	1	576	0.00	2.50	0.33	0.36		.78
	5	552	0.00	3.00	0.38	0.42		.88
Mother warmth	1	665	0.40	3.00	2.18	0.50		.80
	5	604	0.00	3.00	1.96	0.60		.88
Father warmth	1	576	0.00	3.00	2.09	0.61		.86
	5	552	0.00	3.00	1.74	0.70		.91
Family cultural conflict	1	665	0.00	3.00	0.17	0.46	None = 86% Any = 14 %	--
	5	605	0.00	4.00	0.22	0.59	None = 85% Any = 15%	--

Note: *SD* = Standard Deviaion. *α* = Cronbach's alpha.

Table 6. *Correlations among Cultural Variables by Wave.*

	Wave	English					Spanish					American cultural values			Family Values			Mexican American Ethnic Pride		
		1	2	3	4	5	1	2	3	4	5	1	3	5	1	3	5	1	3	5
English	1	1																		
	2	.49	1																	
	3	.33	.36	1																
	4	.34	.38	.47	1															
	5	.27	.30	.40	.47	1														
Spanish	1	-.13	-.19	-.24	-.20	-.22	1													
	2	-.22	-.12	-.18	-.28	-.18	.64	1												
	3	-.24	-.23	-.16	-.31	-.21	.60	.65	1											
	4	-.23	-.26	-.29	-.23	-.27	.58	.59	.72	1										
	5	-.25	-.23	-.25	-.32	-.21	.47	.50	.64	.69	1									
American cultural values	1	.00	-.09	-.07	-.13	-.05	.06	.10	.01	.01	.02	1								
	3	.01	-.03	.02	-.08	-.08	.01	-.01	.05	.04	.09	.39	1							
	5	.02	-.08	.03	-.07	-.08	.01	.00	.04	.02	.03	.28	.48	1						
Family Values	1	.10	.07	-.01	-.03	-.02	.13	.14	.11	.03	.04	.26	-.03	-.06	1					
	3	.04	.06	.12	.05	.04	.06	.12	.18	.13	.16	.13	.20	.04	.38	1				
	5	-.02	.04	-.03	-.09	.02	.10	.24	.17	.16	.19	.13	.14	.11	.28	.54	1			
Mexican American Ethnic Pride	1	.06	-.01	-.02	.00	-.05	.31	.20	.19	.17	.10	.05	-.07	-.07	.45	.17	.11	1		
	3	.00	-.04	-.02	-.05	-.06	.24	.28	.30	.26	.21	-.10	-.08	-.08	.19	.35	.19	.27	1	
	5	.02	.02	-.07	-.04	-.07	.24	.26	.32	.33	.37	-.06	-.05	-.09	.19	.30	.36	.29	.48	1

Note: Correlations greater than $r = .08$ are significant at $p < .05$
N = 287-640.

Table 7. *Correlations among Continuous Relationship Variables by Wave*

Reporter	Variable		Mother				Father			
			Conflict		Warmth		Conflict		Warmth	
		Wave	1	5	1	5	1	5	1	5
Mother	Conflict	1	1							
		5	0.33	1						
	Warmth	1	-0.22	-0.06	1					
		5	-0.16	-0.35	0.25	1				
Father	Conflict	1	0.37	0.17	-0.06	-0.07	1			
		5	0.16	0.48	0.02	-0.11	0.22	1		
	Warmth	1	-0.15	-0.02	0.50	0.20	-0.17	-0.02	1	
		5	-0.10	-0.15	0.21	0.58	-0.16	-0.34	0.33	1

Note: Correlations $r > .08$ are significant at $p < .05$.
N = 474-666.

Table 8. *Estimated Factor Means, Variances, and Covariances: Univariate Linear LGMs for Acculturation and Enculturation Variables.*

	English Use (*N* = 669)		ACV (*N* = 668)		Spanish Use (*N* = 669)		MCV (*N* = 668)		Family Values (*N* = 668)		Mexican American Ethnic Pride (*N* = 668)	
Parameter	Est.	*SE*	Est.	*SE*	Est.	*SE*	Est.	*SE*	Est.	*SE*	Est.	*SE*
Factor means												
Intercept	3.295***	0.022	2.520***	0.023	2.590***	0.030	3.495***	0.013	3.647***	0.013	3.576***	0.019
Linear slope	0.054***	0.006	-0.038***	0.006	-0.032***	0.007	-0.052***	0.004	-0.032***	0.004	-0.01*	0.006
Factor variance												
Intercept	0.165***	0.022	0.142***	0.027	0.380***	0.034	0.039***	0.009	0.037***	0.009	0.058***	0.019
Linear slope	0.008***	0.002	0.006**	0.002	0.014***	0.002	0.003***	0.001	0.003**	0.001	0.006**	0.002
Factor covariance												
INT↔LIN[a]	-0.643***	0.063	-0.546***	0.099	-0.37***	0.067	-0.188	0.174	-0.271	0.161	-0.134	0.250
Fit Indices												
χ^2	25.44 (*df* =16)		23.20 (*df* =12)*		48.13 (*df* =16)***		16.16 (*df* =12)		26.28 (*df* =12)**		22.50 (*df* =12)*	
CFI	.98		.95		.98		.99		.95		.95	
TLI	.98		.96		.98		.99		.95		.95	
RMSEA	.03		.04		.06		.02		.04		.04	
SRMR	.09		.13		.11		.26		.25		.20	

Note. ACV = American Cultural Values, MCV = Mexican Cultural Values, INT = intercept, LIN = linear slope, Est. = unstandardized model estimate. *SE* = standard error of model estimate.

[a] Standardized estimate is presented to illustrate correlation between slope and intercept.

* $p < .05$, ** $p < .01$, *** $p < .001$.

Table 9. *Estimated Fixed and Random Effects: Univariate Linear Multilevel Models (*via *nlme*) *for Acculturation and Enculturation Variables.*

	English Use (*N* = 669)		ACV (*N* = 668)		Spanish Use (*N* = 669)		MCV (*N* = 668)		Family Values (*N* = 668)		Mexican American Ethnic Pride (*N* = 668)	
Parameter	Est.	*SE*	Est.	*SE*	Est.	*SE*	Est.	*SE*	Est.	*SE*	Est.	*SE*
Fixed Effects												
Intercept	3.291***	0.023	2.536***	0.024	2.600***	0.031	3.506***	0.013	3.654***	0.013	3.578***	0.019
Linear slope	0.053***	0.006	-0.042***	0.006	-0.035***	0.007	-0.054***	0.004	-0.033***	0.004	-0.015*	0.006
Random Effects												
Intercept	0.176	--	0.191	--	0.400	--	0.041	--	0.038	--	0.052	--
Linear slope	0.008	--	0.006	--	0.014	--	0.003	--	0.003	--	0.003	--
Cov. of Random Effects												
INT↔LIN[a]	-.673	--	-.746	--	-.430	--	-.199	--	-.312	--	.069	--
Fit Indices												
AIC	3284.08		2329.254		4610.04		744.781		704.614		2207.502	
BIC	3319.47		2362.27		4645.43		777.817		737.651		2240.519	
-LogLikelihood	-1636.04		-1158.627		-2299.02		-366,390		-346.307		-1097.751	

Note. Intercept centered at age 13. ACV = American Cultural Values, MCV = Mexican Cultural Values, INT = intercept, LIN = linear slope, Est. = unstandardized model estimate.
SE = standard error of model estimate.
[a] Standardized estimate is presented to illustrate correlation between slope and intercept.
* $p < .05$, ** $p < .01$, *** $p < .001$.
p values are not available for random effects (including slope ⇔ intercept covariance).
Values are rounded to three decimal places for comparison to model estimates from univariate linear LGMs in Table 8.

Table 10. *Estimated Factor Means, Variances, and Covariances: Quadratic LGMs for Acculturation and Enculturation Variables.*

	English Use (*N* = 669)		ACV (*N* = 668)		Spanish Use (*N* = 669)		MCV (*N* = 668)		Family Values (*N* = 668)		Mexican American Ethnic Pride (*N* = 668)	
Parameter	Est.	*SE*	Est.	*SE*	Est.	*SE*	Est.	*SE*	Est.	*SE*	Est.	*SE*
Factor means												
Intercept	3.469***	0.016	2.370***	0.013	2.473***	0.026	3.346***	0.013	3.564***	0.012	3.562***	0.018
Linear Slope	0.051***	0.006	-0.033***	0.006	-0.026***	0.008	-0.053***	0.004	-0.035***	0.004	-0.022**	0.066
Quadratic slope	-0.006	0.003	0.012**	0.004	0.009*	0.004	-0.002	0.002	-0.005*	0.002	-0.010**	0.003
Factor variance												
Intercept	0.097***	0.007	0.101***	0.009	0.342***	0.022	0.056***	0.004	0.048***	0.004	0.098***	0.009
Linear Slope	0.008***	0.001	0.006**	0.002	0.014***	0.002	0.003***	0.001	0.003**	0.001	0.006**	0.002
Quadratic slope	--	--	--	--	--	--	--	--	--	--	--	--
Factor covariance												
Intercept↔Slope[a]	.014	0.081	-.075	0.120	-.21***	0.065	.564***	0.090	.514***	.092	.636***	0.110
INT↔QUAD[a]	--	--	--	--	--	--	--	--	--	--	--	--
LIN↔QUAD[a]	--	--	--	--	--	--	--	--	--	--	--	--
Fit Indices												
χ^2	22.58 (*df* = 15)		11.90 (11)		42.90 (15)***		15.05 (11)		22.40 (11)*		13.67 (11)	
CFI	.99		1.00		.98		.99		.96		.99	
TLI	.99		1.00		.98		.99		.96		.99	
RMSEA	.03		.01		.05		.02		.04		.02	
SRMR	.09		.12		.09		.26		.26		.20	

Note. Intercept centered at age 13. ACV = American Cultural Values, MCV = Mexican Cultural Values, INT = intercept, LIN = Linear term, QUAD= Quadratic term; Est. = unstandardized model estimate, *SE* = standard error of model estimate. *df* = degrees of freedom, shown in parentheses. [a] Standardized estimate is presented to illustrate correlation between slope and intercept.
* $p < .05$, ** $p < .01$, *** $p < .001$.

Table 11. *Estimated Fixed and Random Effects: Quadratic Multilevel Models for Acculturation and Enculturation Variables.*

	English Use (N = 669)		ACV (N = 668)		Spanish Use (N = 669)		MCV (N = 668)		Family Values (N = 668)		Mexican American Ethnic Pride (N = 668)	
Parameter	Est.	*SE*	Est.	*SE*	Est.	*SE*	Est.	*SE*	Est.	*SE*	Est.	*SE*
Fixed Effects												
Intercept	3.470***	0.016	2.375***	0.018	2.480***	0.026	3.345***	0.012	3.563***	0.012	3.566***	0.018
Linear Slope	0.050***	0.006	-0.038***	0.006	-0.032***	0.007	-0.054***	0.004	-0.034***	0.004	-0.020**	0.006
Quadratic slope	-0.009*	0.003	0.013***	0.004	0.007	0.004	-0.001	0.002	-0.003*	0.002	-0.012**	0.004
Random Effects												
Intercept	0.096	--	0.096	--	0.334	--	0.053	--	0.047	--	0.086	--
Linear Slope	0.008	--	0.006	--	0.014	--	0.003	--	0.003	--	0.003	--
Quadratic slope	--	--	--	--	--	--	--	--	--	--	--	--
Cov. of Random Effects												
INT↔ LIN[a]	-.073	--	-.33	--	-.15	--	.51	--	.50	--	.63	--
INT↔QUAD[a]	--	--	--	--	--	--	--	--	--	--	--	--
LIN↔QUAD[a]	--	--	--	--	--	--	--	--	--	--	--	--
Fit Indices												
AIC	3280.205		2320.007		4609.186		746.7285		704.904		2199.771)	
BIC	3321.489		2358.526		4650.475		785.271		743.446		2238.291	
-LogLikelihood	-1633.103		-1153.003		-2297.593		-366.364		-345.452		-1092.886	

Note. ACV = American Cultural Values, MCV = Mexican Cultural Values, INT = intercept, LIN = Linear term, QUAD= Quadratic term; Est. = unstandardized model estimate, *SE* = standard error of model estimate. *df* = degrees of freedom, shown in parentheses. *Cov.* = Covariance.

[a] Standardized estimate is presented to illustrate correlation between slope and intercept.

* $p < .05$, ** $p < .01$, *** $p < .001$.

Values are rounded to three decimal places for comparison to model estimates from univariate linear LGMs in Table 10.

Table 12. *Results from Multi-group LGMs Showing Chi-square Comparisons and Model Estimates*.

	Fully Fixed Model	Means (Fixed Terms)			Variances (Random Terms)		Covariance
Variable		Intercept	Linear Slope (at age 10)	Quadratic Curve	Intercept	Slope	Intercept ⇔ slope
English use		b = 3.29	b = 0.05	--	b = 0.17	b = 0.01	β = 0.65
	$\chi2$(df=37) = 50.11	$\Delta\chi2$ = 0.07	$\Delta\chi2$ = 1.26	--	$\Delta\chi2$ = 0.33	$\Delta\chi2$ = 0.04	$\Delta\chi2$ = 0.28
American cultural values		$b_{Females}$ = 2.53 b_{Males} = 2.63	b = -0.11	b = 0.012	b = 0.14	b = .001	β =- 0.56
	$\chi2$(df=27) = 43.78	$\Delta\chi2$ = 12.66*	$\Delta\chi2$ = 2.57	$\Delta\chi2$ = 0.32	$\Delta\chi2$ = 0.01	$\Delta\chi2$ = 1.65	$\Delta\chi2$ = 0.31
Spanish use		$b_{Females}$ = 2.71 b_{Males} = 2.57	b = -0.08	b = .009	b = 0.38	b = 0.014	β = -0.39
	$\chi2$(df=36) = 63.24	$\Delta\chi2$ = 8.46*	$\Delta\chi2$ = 0.77	$\Delta\chi2$ = 0.82	$\Delta\chi2$ = 0.22	$\Delta\chi2$ = 0.07	$\Delta\chi2$ = 1.33
Mexican Cultural Values		b = 3.50	b = -0.05	--	b = 0.04	b = 0.003	β = -0.22
	$\chi2$(df=28) = 35.17	$\Delta\chi2$ = 0.60	$\Delta\chi2$ = 0.80	--	$\Delta\chi2$ = 0.01	$\Delta\chi2$ = 1.47	$\Delta\chi2$ = 1.16
Traditional Family Values		b = 3.63	b =-0.01	b = -0.004	b = 0.04	b = 0.003	β = -0.31
	$\chi2$(df=27) = 36.36	†	$\Delta\chi2$ = 0.01	$\Delta\chi2$ = 0.13	$\Delta\chi2$ = 0.31	$\Delta\chi2$ = 2.41	$\Delta\chi2$ = 1.98
MAEP		$b_{females}$ = 3.56 b_{males}= 3.51	$b_{females}$ = 0.06 b_{males}= 0.03	b = -0.012	b = 0.05	b = .004	β = -0.02
	$\chi2$(df=27) = 42.83	$\Delta\chi2$ = 13.06*	$\Delta\chi2$ = 4.53*	$\Delta\chi2$ = 0.50	$\Delta\chi2$ = 0.66	$\Delta\chi2$ = 1.79	$\Delta\chi2$ = 0.66

Note: Critical ($p < .05$) chi-sq value = 3.84. * $p < .05$.

† = convergence problems when freely estimating parameter in multi-group model

Table 13.*Estimated Regression Coefficients-- Age 10 Covariates Predicting LGM Parameters for Acculturation and Enculturation Variables.*

Parameter	*Gender* [a]	*Generation Status (1 vs. 2)* [b]	*Generation Status (1 vs. 3)* [b]	*Mother Education*	*Family Income*	*Peer Discrimination*	*Combined Discrimination*
English Use							
Intercept	0.03 (.04)	0.16 (.05)**	0.43 (.09)***	0.02 (.01)*	0.00 (.01)	0.10 (.19)	-0.01 (.26)
Slope	-0.01 (.01)	-0.01 (.01)	-0.01 (.02)	0.00 (.00)	0.00 (.00)	-0.06 (.05)	0.04 (.07)
ACV							
Intercept	0.07 (.05)	0.06 (.06)	0.19 (.10)^	-0.02 (.01)***	-0.01 (.01)	0.40 (.20)*	0.50 (.28)^
Slope	0.01 (.01)	-0.01 (.02)	-0.04 (.03)	0.004 (.00)*	0.00 (0.00)	-0.05 (.05)	0.02 (.08)
Spanish Use							
Intercept	-0.09 (.06)	-0.25 (.07)***	-1.08 (.11)***	0.00 (.01)	-0.01 (.01)	0.25 (.24)	0.48 (.34)
Slope	-0.02 (.01)	0.01 (.02)	0.01 (.03)	0.00 (.00)	0.00 (.00)	-0.04 (.06)	-0.07 (.09)
MCV							
Intercept	0.00 (.03)	-0.04 (.03)	-0.06 (.05)	0.00 (.00)	0.00 (.00)	0.21 (.11)^	0.02 (.15)
Slope	0.01 (.01)	0.01 (.01)	0.01 (.02)	0.00 (.00)	0.00 (.00)	-0.05 (.03)	0.10 (.05)*
Family Values							
Intercept	-0.01 (.03)	-0.03 (.03)	-0.03 (.05)	0.00 (.00)	0.00 (.00)	0.15 (.11)	-0.11 (.15)
Slope	0.00 (.01)	0.00 (.01)	0.00 (.02)	0.00 (.00)	0.00 (.00)	-0.05 (.04)	0.11 (.05)*
Ethnic Pride							
Intercept	-0.02 (.01)	-0.11 (.04)**	-0.28 (.08)***	0.01 (0.01)^	0.00 (.01)	0.15 (.16)	-0.29 (.22)
Slope	-0.02 (.01)	0.01 (.01)	-.01 (.02)	0.00 (.00)	0.003 (.00)^	-0.07 (.05)	0.07 (.07)

Note. $N = 674$. ACV = American Cultural Values, MCV = Mexican Cultural Values. Values are unstandardized estimates with standard error of estimate in parentheses. [a] Males are reference group. [b] 1st generation is the reference group.
^ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 14. *Model Fit Comparisons for Different Specifications of Substance Use Outcome Variables.*

Outcome		Continuous	ZIP	ZINB	ZIH
Substance Use Intentions	AIC	7082.74	8263.31	8163.80	8164.35
	BIC	7136.66	8339.70	8244.69	8245.24
Alcohol Use Intensity	AIC	7985.90	7354.78	7354.04	--
	BIC	8039.82	7431.18	7434.93	--

Note: *ZIP* = Zero-Inflated Poisson; *ZINB* = Zero-Inflated Negative Binomial; *ZIH* = Zero-Inflated Hurdle Model.

Table 15. *Regressing Age 15 Substance Use Intentions (Specified as Continuous Variable) on Growth Parameters for Cultural Predictors.*

	Parameter	*b*	*SE*	*95% CI*
English	Intercept	0.17*	0.07	[0.04, 0.31]
	Slope	-1.12**	0.36	[-1.82, -0.41]
American Cultural Values	Intercept	0.00	0.08	[-0.15, 0.14]
	Slope	0.66	0.56	[-0.45, 1.76]
Spanish	Intercept	-0.02	0.04	[-0.09, 0.05]
	Slope	0.08	0.25	[-0.41, 0.58]
Mexican Cultural Values	Intercept	-0.06	0.13	[-0.31, 0.19]
	Slope	-0.89	1.05	[-2.94, 1.16]
Family Values	Intercept	-0.08	0.13	[-0.34, 0.17]
	Slope	-0.97	1.13	[-3.19, 1.24]
Mexican-American Ethnic Pride	Intercept	0.29	0.26	[-0.22, 0.81]
	Slope	-2.50	1.99	[-6.40, 1.41]

Note: ** $p < .01$, * $p < .05$. *SE* = Standardized Error of the Estimate. *CI* = Confidence Interval. Covariates not shown due to space constraints.

Table 16. *Regressing Age 15 Substance Use Intentions* (*Count—Zero-Inflated Negative Binomial Specified Models*) *on Growth Parameters for Cultural Predictors.*

		Count				*Logit*			
	Parameter	*RR*	*RR 95% CI*	*b*	*SE*	*OR*	*OR 95% CI*	*b*	*SE*
English	Intercept	1.30*	[1.06, 1.60]	0.74	0.29	0.94	[0.60, 1.60]	-0.16	0.64
	Slope	0.75*	[0.59, 0.95]	-3.22	1.36	1.58	[0.88, 2.83]	5.12	3.33
American Cultural Values	Intercept	1.13	[0.80, 1.59]	0.35	0.48	1.50	[0.67, 3.35]	1.13	1.14
	Slope	0.83	[0.53, 1.30]	-2.69	3.26	0.27^	[0.07, 1.04]	-18.49	9.71
Spanish	Intercept	0.84	[0.69, 1.03]	-0.26	0.15	0.73	[0.47, 1.11]	-0.47	0.32
	Slope	1.11	[0.89, 1.38]	0.93	1.04	1.21	[0.71, 2.04]	1.72	2.45
Mexican Cultural Values	Intercept	1.25	[0.84, 1.86]	0.72	0.65	1.96	[0.72, 5.33]	2.17	1.65
	Slope	0.67	[0.39, 1.14]	-7.32	4.93	0.72	[0.21, 2.43]	-5.95	11.31
Family Values	Intercept	1.02	[0.71, 1.46]	0.07	0.65	1.21	[0.55, 2.65]	0.67	1.44
	Slope	0.85	[0.55, 1.33]	-3.60	5.07	1.33	[0.50, 3.57]	6.45	11.24
Mexican American Ethnic Pride	Intercept	1.52	[0.78, 2.98]	1.00	0.82	16913.81	--	23.34	15.93
	Slope	0.61	[0.28, 1.34]	-6.94	5.67	0.86	[0.65, 1.15]	-2.09	2.06

Note: * $p < .05$. *RR* = Rate Ratio; *SE* = Standard Error of the Estimate. Covariates not shown due to space constraints.

Table 17. *Results from Parallel Process Growth Models Linking Cultural Processes and Likelihood of Any Substance Use Intentions from Age 10 to 15*

		English *b* (*SE*)	ACVS *b* (*SE*)	SPA *b* (*SE*)	MCVS *b* (*SE*)	FAMV *b* (*SE*)	MAEP *b* (*SE*)
Regression Parameters	Culture Level → SUI Level	1.34 (.09)***	-0.66 (.13)*	-0.14 (.59)	-1.02 (.08)***	0.47 (.09)***	2.27 (.09)***
	Culture Slope → SUI Level	-13.90 (3.42)***	3.63 (5.60)**	-0.56 (4.71)	-5.59 (3.15)^	-19.26 (6.44)**	-21.46 (4.58)***
Covariance Parameters	Culture Level ⇔ Culture Slope	0.02 (.00)***	0.01 (.01)*	0.04 (.01)***	0.01 (.00)***	0.01 (.00)**	0.02 (.01)*
	SUI Level ⇔ SUI Slope	1.87 (.44)***	1.67 (.43)***	2.01 (.54)***	1.70 (.42)***	1.64 (.44)***	1.66 (.48)***
	Culture Slope ⇔ SUI Slope†	-0.014 (.01)**	0.015 (.01)**	-0.01 (.02)	-0.003 (.003)	-0.007 (.004)^	-0.015 (.005)**

Note: Each column represents separate parallel process regression model
^ = $p < .08$, * $p < .05$, ** $p < .01$, *** $p < .001$; *b* = unstandardized regression estimate; *SE* = Standard error of estimate.
† Parallel process parameter

Table 18. *Regressing Age 15 Alcohol Use Intensity (Past 3 months) as Zero-Inflated Poisson Specified Count Outcome on Growth Parameters for Cultural Predictors*

		Count				*Logit*			
	Parameter	*RR*	*95% CI RR*	*b*	*SE*	*OR*	*OR 95% CI*	*b*	*SE*
English	Intercept	1.74**	[1.18, 2.55]	1.55	0.55	1.65	[0.94, 2.89]	1.41	0.80
	Slope	0.56**	[0.38, 0.83]	-6.48	2.26	1.13	[0.58, 2.18]	1.33	3.77
American Cultural Values	Intercept	1.17	[0.82, 1.64]	0.44	0.48	0.96	[0.60, 1.54]	-0.12	0.68
	Slope	0.59*	[0.38, 0.92]	-7.35	3.18	0.68	[0.31, 1.50]	-5.51	5.73
Spanish	Intercept	0.77	[0.53, 1.14]	-0.38	0.29	0.97	[0.63, 1.53]	-0.04	0.34
	Slope	1.35	[0.64, 2.83]	2.72	3.46	1.05	[0.53, 2.08]	0.43	3.19
Mexican Cultural Values	Intercept	1.15	[0.64, 2.09]	0.46	0.97	0.92	[0.40, 2.13]	-0.25	1.35
	Slope	0.54*	[0.30, 0.97]	-11.24	5.50	0.88	[0.32, 2.42]	-2.27	9.41
Family Values	Intercept	1.35	[0.67, 2.69]	1.06	1.25	1.37	[0.56, 3.34]	1.11	1.61
	Slope	0.56^	[0.31, 1.02]	-12.84	6.76	0.59	[0.20, 1.70]	-11.80	12.08
Mexican American Ethnic Pride	Intercept	1.62	[0.72, 3.69]	1.16	1.00	0.55	[0.11, 2.76]	-1.44	1.97
	Slope	0.45	[0.18, 1.10]	-11.40	6.50	2.00	[0.27, 14.83]	9.77	14.48

Note: ^ $p < .07$, * $p < .05$.
RR = Rate Ratio; *OR* = Odds Ratio; SE = Standard Error of the Estimate.

Table 19. Regressing Age 15 Any Alcohol Use (Past 3 months) on Growth Parameters for Cultural Predictors.

		Logistic Model			
	Parameter	*OR*	*OR 95% CI*	*b*	*SE*
English Use	Intercept	0.86	[0.63, 1.27]	-0.41	0.55
	Slope	0.68	[0.40, 1.18]	-4.57	3.32
American Cultural Values	Intercept	1.13	[0.73, 1.76]	0.40	0.71
	Slope	1.27	[0.37, 4.38]	7.61	19.96
Spanish Use	Intercept	0.92	[0.64, 1.32]	-0.12	0.28
	Slope	1.10	[0.64, 1.86]	0.84	2.49
Mexican Cultural Values	Intercept	1.15	[0.52, 2.55]	0.44	1.30
	Slope	0.85	[0.23, 2.27]	-3.00	9.16
Family Values	Intercept	0.84	[0.40, 1.74]	-0.64	1.34
	Slope	1.33	[0.50, 3.53]	6.32	11.17
Mexican-American Ethnic Pride	Intercept	2.07	[0.38, 11.08]	1.71	2.02
	Slope	0.27	[0.02, 4.37]	-13.19	14.26

Note: *OR* = Odds Ratio; *CI*= Confidence Interval. *b* = unstandardized estimate; *SE* = standard error of estimate.

Table 20. Regressing Age 15 Any Cannabis Use (Past 3 months) on Growth Parameters for Cultural Predictors.

		Logistic Model			
	Parameter	*OR*	*OR 95% CI*	*b*	*SE*
English	Intercept	1.20	[0.72, 1.85]	0.51	0.74
	Slope	0.83	[0.46, 1.51]	-2.20	3.61
American Cultural Values	Intercept	1.45	[0.91, 2.31]	1.14	0.73
	Slope	0.63	[0.27, 1.51]	-10.21	9.92
Spanish	Intercept	0.81	[0.53, 1.26]	-0.31	0.33
	Slope	0.89	[0.47, 1.70]	-1.03	3.00
Mexican Cultural Values	Intercept	1.55	[0.63, 3.81]	1.40	1.45
	Slope	0.58	[0.18, 1.87]	-9.86	10.87
Family Values	Intercept	1.11	[0.52, 2.36]	0.36	1.38
	Slope	0.93	[0.34, 2.59]	-1.56	11.67
Mexican-American Ethnic Pride	Intercept	2.69	[0.24, 30.08]	2.41	2.99
	Slope	0.33	[0.02, 6.08]	-17.47	23.47

Note: *OR* = Odds Ratio; *CI*= Confidence Interval. *b* = unstandardized estimate; *SE* = standard error of estimate.

Table 21. Aim 2 Summary Table for Effects of Cultural Growth Parameters Predicting Substance Use Outcomes.

Predictor	Parameter	Substance Use Intentions (Degree)[a]	Substance Use Intentions (Likelihood)	Alcohol Use Intensity (Degree)	Any Alcohol Use (Likelihood)[b]	Cannabis Use Likelihood
English Use	Age 15	+	0	+	-	-
	Slope	–	-	–	–	–
American Cultural Values	Age 15	+	-	+	+	0
	Slope	Mixed findings	+	–	+	+
Spanish Use	Age 15	0	+	–	0	0
	Slope	0	-	+	0	0
Mexican Cultural Values	Age 15	Mixed findings	–	+	+	0
	Slope	–	+	–	0	0
Traditional Family Values	Age 15	0	-	+	-	+
	Slope	–	+	–	+	+
Mexican-American Ethnic Pride	Age 15	+	Error	+	+	+
	Slope	–	+	–	–	–

Note: + = risk effect. – = protective effect. Font size = size of effect. 0 = no effect. Mixed findings = point estimate in opposite directions across models. [a] Summary of continuous and ZINB models. [b] Summary of ZIP logistic, and basic Logistic model.

Table 22. Aim Three English Use Latent Growth Mediation Models

Mediator	Outcome	(*a1*) Intercept → mediator	(*a2*) Slope → mediator	(*b*) Mediator → SU	(*c'1*) Intercept → SU	*a1 * b* Indirect Effect Intercept [95% CI]	(*c'2*) Slope → SU	*a2 * b* Indirect Effect Slope [95% CI]
Parent Warmth	SUI	0.08 (.10)	1.17 (.66)***	-2.04 (.45)***	1.47 (.65)*	-0.16 [-0.59, 0.21]	-6.80 (5.98)	-2.38 [-5.03, -0.79]†
	Any Alcohol	0.08 (.09)	1.03 (.54)^	-0.16 (.05)**	0.04 (.07)	-0.01 [-0.05, 0.01]	-0.56 (.47)	-0.16 [-0.41, -0.03]†
	Any Cannabis	0.07 (.08)	0.97 (.57)	-0.17 (0.05)***	0.07 (.06)	-0.01 [-0.05, 0.02]	0.17 (.30)	-0.16 [-0.42, -0.03]†
Parent Child Conflict	SUI	0.12 (.09)	-0.39 (.71)	2.84 (.58)***	0.66 (.61)	0.35 [-0.14, 0.88]	-6.47 (4.17)	-1.12 [-4.21, 1.55]
	Any Alcohol	0.12 (.09)	-0.41 (0.54)	0.17 (.06)**	-0.02 (.07)	0.02 [-0.01, 0.07]	-0.59 (.52)	-0.07 [-0.28, 0.08]
	Any Cannabis	0.12 (.09)	-0.40 (.48)	0.17 (.05)**	0.01 (.06)	0.02 [-0.01, 0.07]	0.19 (.30)	-0.07 [-0.30, .07]
Family Cultural Conflict	SUI	0.11 (.06)^	0.21 (.38)	1.58 (.47)**	0.97 (.64)	0.18 [0.01, 0.42]†	-8.63 (4.34)*	0.33 [-0.67, 1.97]
	Any Alcohol	0.11 (.06)^	0.21 (.40)	0.14 (.05)*	0.00 (.07)	0.02 [-0.004, 0.04]	-0.73 (.50)	0.03 [-0.11, 0.16]
	Any Cannabis	0.11 (.06)^	0.20 (.39)	0.08 (.04)*	0.03 (.06)	0.01 [0.001, 0.03]†	0.06 (.29)	0.02 [-0.04, 0.13]

Note: : ^ $p < .08$,* $p < .05$, ** $p < .01$, *** $p < .001$. Values Shown are Regression Estimates with Standard Errors in Parentheses.
† Significant indirect effect in which 95% confidence interval does not contain zero
SUI = Substance Use Intentions Specified as Continuous Outcome. SU = Substance use outcome (SUI, Any Alcohol or Any Cannabis).

Table 23. Aim 3 Spanish Use Latent Growth Mediation Models

Mediator	Outcome	(*a1*) Intercept→ mediator	(*a2*) Slope → mediator	(*b*) Mediator → SU	(*c'1*) Intercept → SU	*a1 * b* Indirect Effect Intercept [95% CI]	(*c'2*) Slope → SU	*a2 * b* Indirect Effect Slope [95% CI]
Parent Warmth	SUI	0.11 (.05)*	0.67 (.33)*	-2.12 (.40)***	-0.21 (.27)	-0.23 [-0.53, -0.05]†	-0.57 (1.54)	-1.41 [-3.40, -0.28]†
	Any Alcohol	0.10 (.05)^	0.60 (.33)^	-0.17 (.05)***	0.00 (.03)	-0.02 [-0.05, -0.003]†	0.14 (.19)	-0.11 [-0.29, -0.02]†
	Any Cannabis	0.10 (.05)^	0.55 (.32)	-0.15 (.04)***	-0.01 (.03)	-0.02 [-0.04, -0.003]†	-0.21 (.16)	-0.09 [-0.24, 0.01]
Parent Child Conflict	SUI	-0.06 (.04)	-0.20 (.22)	3.03 (.59)***	-0.33 (.28)	-0.18 [-0.47, 0.06]	-1.29 (1.46)	-0.61 [-2.32, 0.57]
	Any Alcohol	-0.06 (.04)	-0.20 (.22)	0.18 (.06)**	-0.02 (.03)	-0.01 [-0.03, 0.003]	0.09 (.18)	-0.04 [-0.15, 0.03]
	Any Cannabis	-0.06 (.04)	-0.20 (.22)	0.16 (.05)**	-0.02 (.03)	-0.01 [-0.03, 0.002]	-0.26 (.16)	-0.03 [-0.12, 0.03]
Family Cultural Conflict	SUI	-0.05 (.03)	-0.47 (.20)*	1.61 (.43)***	-0.55 (.29)^	-0.07 [-0.22, 0.02]	-0.89 (1.55)	-0.76 [-1.76, -0.20]†
	Any Alcohol	-0.05 (0.03)	-0.47 (.21)*	0.14 (.05)**	-0.03 (.03)	-0.01 [-0.02, 0.004]	0.13 (.19)	-0.07 [-0.14, 0.004]
	Any Cannabis	-0.05 (.03)	-0.47 (.20)*	0.07 (.04)	-0.04 (.03)	0.00 [-0.01, 0.001]	-0.24 (.16)	-0.03 [-0.11, -0.002]†

Note: : ^ $p < .08$,* $p < .05$, ** $p < .01$, *** $p < .001$. Values Shown are Regression Estimates with Standard Errors in Parentheses.
† Significant indirect effect in which 95% confidence interval does not contain zero
SUI = Substance Use Intentions Specified as Continuous Outcome. SU = Substance use outcome (SUI, Any Alcohol or Any Cannabis).

Table 24. Aim Three American Cultural Values Latent Growth Mediation Models

Mediator	Outcome	(*a1*) Intercept→ mediator	(*a2*) Slope → mediator	(*b*) Mediator → SU	(*c'1*) Intercept → SU	*a1 * b* Indirect Effect Intercept [95% CI]	(*c'2*) Slope → SU	*a2 * b* Indirect Effect Slope [95% CI]
Parent Warmth	SUI	-0.11 (.12)	-0.74 (1.45)	-2.20 (.56)***	-0.65 (.73)	0.25 [-0.08, 0.78]	2.38 (10.33)	1.63 [-0.08, 4.73]
	Any Alcohol	-0.11 (.09)	-0.73 (.67)	-0.18 (.05)**	-0.12 (.07)	0.02 [-0.004, 0.06]	-0.03 (.48)	0.13 [0.01, 0.39]†
	Any Cannabis	-0.10 (.09)	-0.73 (.88)	-0.17 (.05)***	-0.02 (.05)	0.02 [-0.01, 0.05]	-0.09 (.48)	0.12 [0.01, 0.36]†
Parent Child Conflict	SUI	-0.18 (.09)^	0.38 (.59)	3.07 (.58)***	0.13 (.51)	-0.54 [-1.16, -0.03]†	3.46 (3.24)	1.17 [-0.94, 4.78]
	Any Alcohol	-0.17 (12)	0.41 (1.12)	0.19 (.06)**	-0.06 (.08)	-0.03 [-0.08, -0.003]†	0.09 (.63)	0.08 [-0.05, 0.36]
	Any Cannabis	-0.17 (.09)^	0.38 (.75)	0.17 (.05)**	0.03 (.06)	-0.03 [-0.08, -0.005]†	0.02 (.36)	0.07 [-0.04, 0.32]
Family Cultural Conflict	SUI	0.00 (.07)	0.73 (.41)^	1.49 (.48)**	-0.26 (.54)	0.00 [-0.21, 0.19]	3.32 (3.95)	1.08 [0.28, 2.85]†
	Any Alcohol	0.00 (.07)	0.73 (.41)^	0.13 (.05)*	-0.09 (.07)	0.00 [-0.02, 0.02]	0.06 (.38)	0.09 [0.02, 0.26]†
	Any Cannabis	0.00 (.07)	0.73 (.40)^	0.08 (.04)*	0.01 (.05)	0.00 [-0.01, 0.01]	0.01 (.27)	0.06 [0.003, 0.21]†

Note: : ^ $p < .08$,* $p < .05$, ** $p < .01$, *** $p < .001$. Values Shown are Regression Estimates with Standard Errors in Parentheses.
† Significant indirect effect in which 95% confidence interval does not contain zero
SUI = Substance Use Intentions Specified as Continuous Outcome. SU = Substance use outcome (SUI, Any Alcohol or Any Cannabis).

Table 25. Aim Three Traditional Family Values Latent Growth Mediation Models

Mediator	Outcome	(*a1*) Intercept→ mediator	(*a2*) Slope → mediator	(*b*) Mediator → SU	(*c'1*) Intercept→ SU	*a1 * b* Indirect Effect Intercept [95% CI]	(*c'2*) Slope → SU	*a2 * b* Indirect Effect Slope [95% CI]
Parent Warmth	SUI	0.44 (.56)	3.34 (2.34)	-1.54 (.72)*	-1.28 (1.86)	-0.67 [-1.78, 0.08]	-8.55 (11.60)	-5.14 [-10.57, -1.62]†
	Any Alcohol	0.43 (.29)	3.13 (1.18)**	-0.13 (.06)*	-0.15 (.13)	-0.06 [-0.16, -0.002]†	-0.37 (.57)	-0.40 [-1.05, -0.07]†
	Any Cannabis	0.41 (.45)	3.14 (1.87)	-0.12 (.06)*	-0.05 (.13)	-0.05 [-0.15, 0.002]	-0.34 (.80)	-0.38 [-0.89, -0.05]†
Parent Child Conflict	SUI	-0.16 (.23)	-1.94 (1.04)^	3.02 (.60)***	-1.79 (1.22)	-0.48 [-1.60, 0.59]	-7.15 (5.63)	-5.84 [-13.48, -2.58]†
	Any Alcohol	-0.16 (.27)	-1.94 (1.24)	0.19 (.07)**	-0.20 (.15)	-0.03 [-0.11, 0.02]	-0.39 (.65)	-0.37 [-1.07, -0.12]†
	Any Cannabis	-0.15 (.22)	-1.98 (1.08)^	0.17 (.05)**	-0.11 (.11)	-0.03 [-0.09, 0.03]	-0.36 (.50)	-0.34 [-0.93, -0.12]†
Family Cultural Conflict	SUI	-0.29 (.13)*	-1.07 (.45)*	1.17 (.42)**	-2.26 (1.11)*	-0.34 [-0.93, -0.05]†	-11.73 (5.04)*	-1.25 [-3.06, -0.31]†
	Any Alcohol	-0.29 (.13)*	-1.05 (.46)*	0.10 (.05)*	-0.22 (.13)	-0.03 [-0.09, -0.003]†	-0.63 (.50)	-0.11 [-0.34, -0.01]†
	Any Cannabis	-0.29 (.13)*	-1.06 (.46)*	0.06 (.04)	-0.14 (.10)	-0.02 [-0.06, 0.002]	-0.62 (.42)	-0.06 [-0.23, 0.01]

Note: ^ $p < .08$,* $p < .05$, ** $p < .01$, *** $p < .001$. Values Shown are Regression Estimates with Standard Errors in Parentheses.
† Significant indirect effect in which 95% confidence interval does not contain zero
SUI = Substance Use Intentions Specified as Continuous Outcome. SU = Substance use outcome (SUI, Any Alcohol or Any Cannabis).

Table 26. Aim Three Mexican-American Ethnic Pride Latent Growth Mediation Models

Mediator	Outcome	(*a1*) Intercept→ mediator	(*a2*) Slope → mediator	(*b*) Mediator → SU	(*c'1*) Intercept→ SU	*a1 * b* Indirect Effect Intercept [95% CI]	(*c'2*) Slope → SU	*a2 * b* Indirect Effect Slope [95% CI]
Parent Warmth	SUI	-0.64 (.92)	4.54 (2.85)	-1.37 (.91)	4.48 (4.22)	0.88 [0.09, 9.06]†	-12.36 (13.51)	-6.22 [-33.68, -2.85]†
	Any Alcohol	-0.19 (.67)	3.03 (2.14)	-0.15 (.09)	0.18 (.33)	0.03 [-0.05, 0.86]	-0.31 (1.16)	-0.46 [-4.01, -0.12]†
	Any Cannabis	-0.39 (.91)	3.57 (2.82)	-0.13 (.09)	0.31 (.37)	0.05 [-0.02, 1.19]	-0.39 (1.23)	-0.48 [-4.96, -0.16]†
Parent Child Conflict	SUI	0.43 (.58)	-1.54 (1.60)	2.99 (.64)***	1.04 (2.81)	1.29 [0.18, 8.25]†	-5.95 (8.41)	-4.59 [-18.76, -0.97]†
	Any Alcohol	0.54 (.71)	-1.85 (2.11)	0.17 (.08)*	0.12 (.40)	0.09 [0.02, 0.07]†	-0.60 (1.23)	-0.32 [-2.48, -0.06]†
	Any Cannabis	0.56 (.65)	-1.91 (2.09)	0.15 (.06)*	0.18 (.31)	0.08 [0.02, 0.65]†	-0.43 (.97)	-0.29 [-1.77, -0.07]†
Family Cultural Conflict	SUI	0.14 (.51)	-1.25 (1.50)	1.21 (1.36)	2.24 (5.79)	0.17 [-0.11, 2.05]	-9.27 (17.69)	-1.51 [-63.96, -0.45]†
	Any Alcohol	0.12 (.46)	-1.20 (1.38)	0.11 (.10)	-0.15 (.49)	0.01 [-0.02, 1.79]	-0.63 (1.49)	-0.13 [-14.06, -0.03]†
	Any Cannabis	0.12 (.39)	-1.20 (1.20)	0.06 (.10)	0.21 (.39)	0.01 [-0.01, 4.01]	-0.50 (1.27)	-0.07 [-9.72, 0.06]

Note: ^ $p < .08$,* $p < .05$, ** $p < .01$, *** $p < .001$. Values Shown are Regression Estimates with Standard Errors in Parentheses.
† Significant indirect effect in which 95% confidence interval does not contain zero. SUI = Substance Use Intentions Specified as Continuous Outcome. SU = Substance use outcome (SUI, Any Alcohol or Any Cannabis).

Table 27. Summary of mediation effects with number of significant mediation pathways for three substance use outcomes.

Cultural Predictor (Slope)	Mediator	Number of SU outcomes with significant indirect effect†
↑ English use	↑ Warmth	3/3 = 100%
	Parent-child conflict	0/3 = 0%
	Family cultural conflict	0/3 = 0%
↑ American cultural values	↓ Warmth	2/3 = 67%
	Parent-child conflict	0/3 = 0%
	↑ Family cultural conflict	3/3 = 100%
↑ Spanish Use	↑ Warmth	2/3 = 67%
	Parent-child conflict	0/3 = 0%
	↓ Family cultural conflict	2/3 = 67%
↑ Traditional Family Values	↑ Warmth	3/3 = 100%
	↓ Parent-child conflict	3/3 = 100%
	↓ Family cultural conflict	2/3 = 67%
↑ Mexican American Ethnic Pride	↑ Warmth	3/3 = 100%
	↓ Parent-child conflict	3/3 = 100%
	↓ Family cultural conflict	2/3 = 67%

Note: † (95% CI does not contain 0). Decreased substance use risk (substance use intentions, any alcohol and any cannabis use) related to higher parent warmth, lower parent child conflict, and absence of family cultural conflict. Green arrow indicates protective factor (i.e., decreased substance use risk) while red indicates risk factor.

Figure 1. Box and Whisker Plot Illustrating Distribution of Time Interval between Measurement Points.

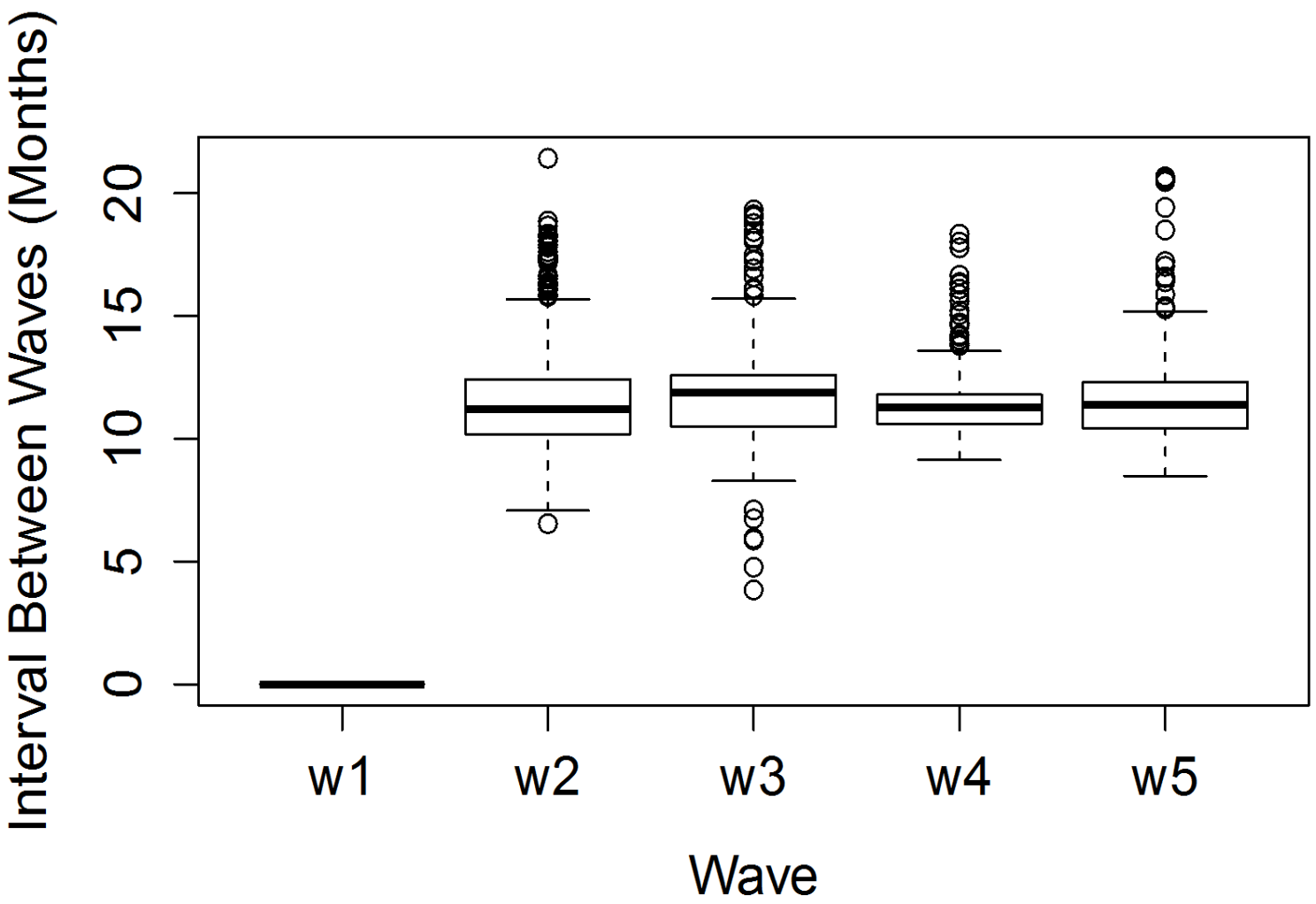


Figure 2. Histogram of Substance Use Intentions (Count) by Age

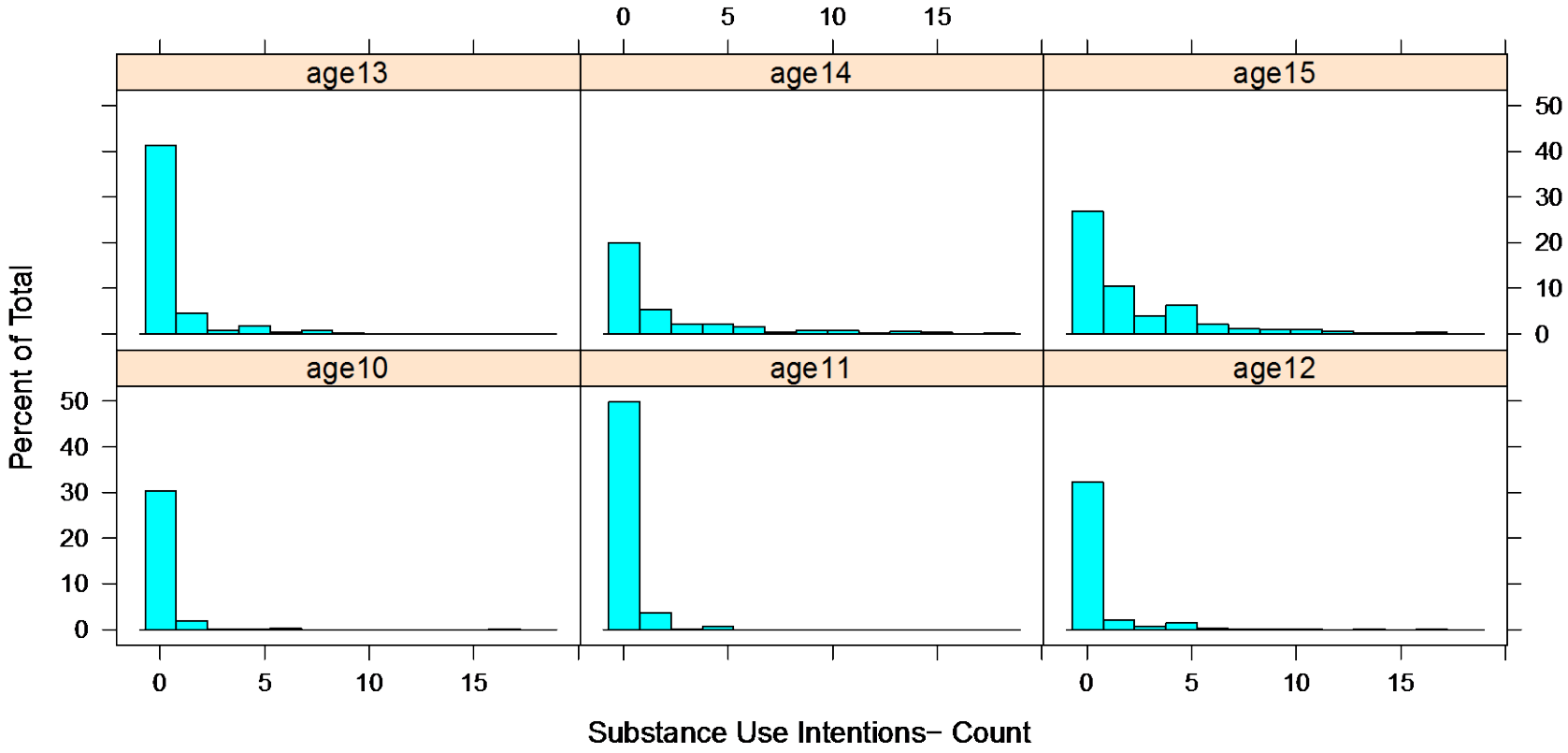


Figure 3. Histogram of Alcohol Use Intensity (Variety x Frequency) Count at Age 15

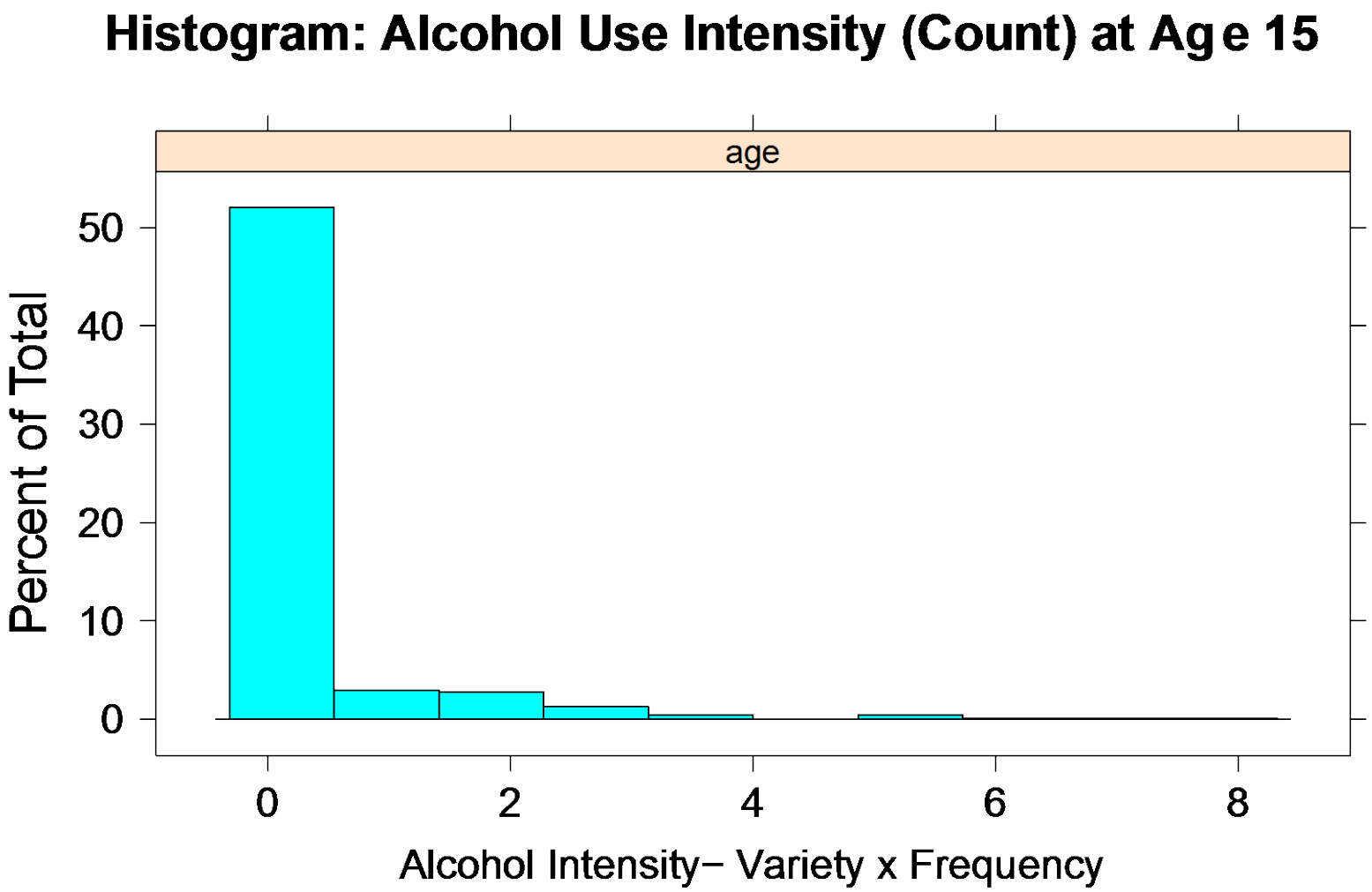


Figure 4. Prevalence of Any Substance Use Intentions (SUI), and Any Past Three Month Alcohol Use and Cannabis Use at Age 15

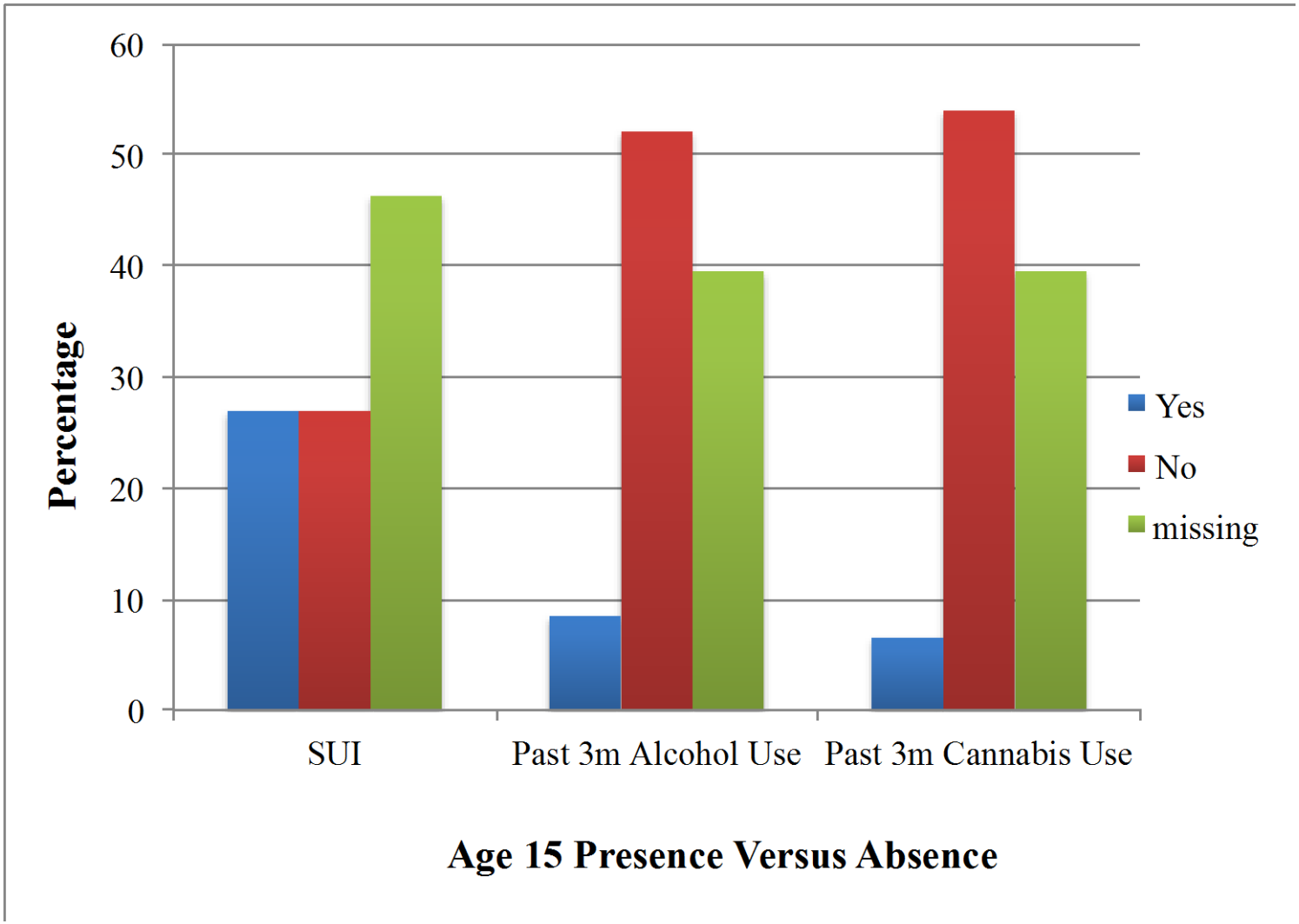


Figure 5. Example of Unconstrained Linear Growth Model for English Use

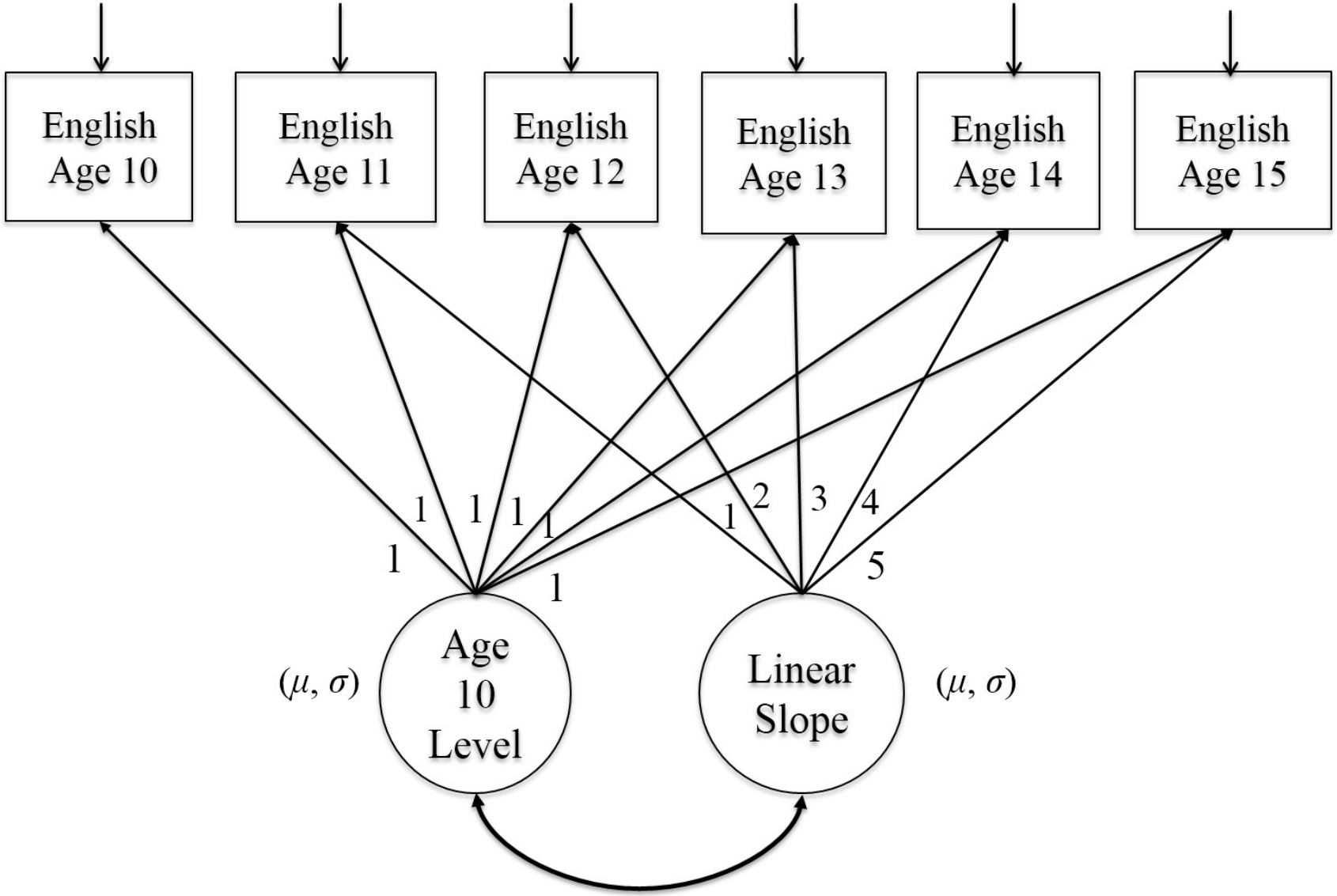


Figure 6. Trellis Plot of Spanish Use for Five Random Subjects Illustrating Variation in Data Missingness and Observed Scores Over Time

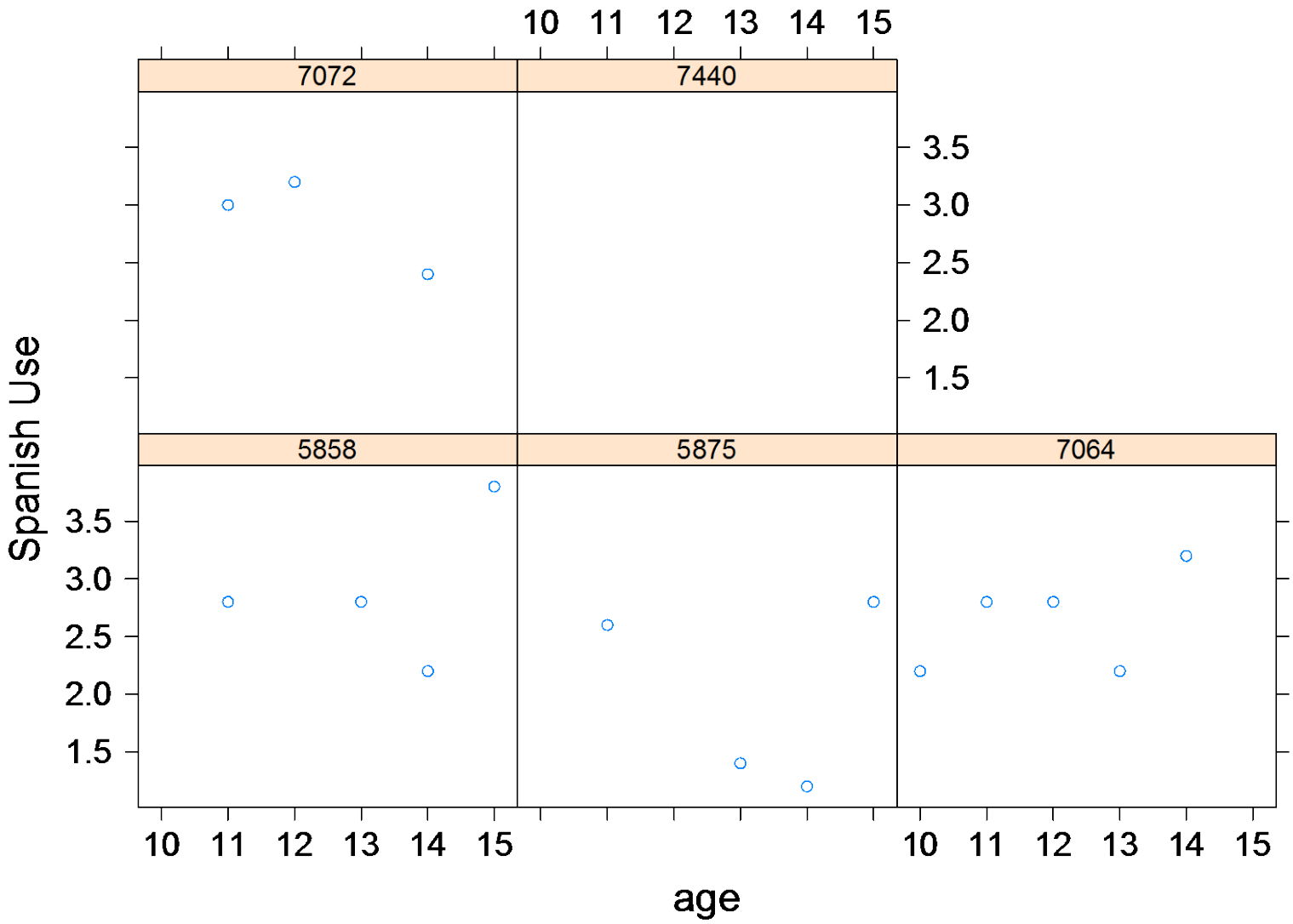


Figure 7. Example of Unconstrained Quadratic Growth Model for English Use

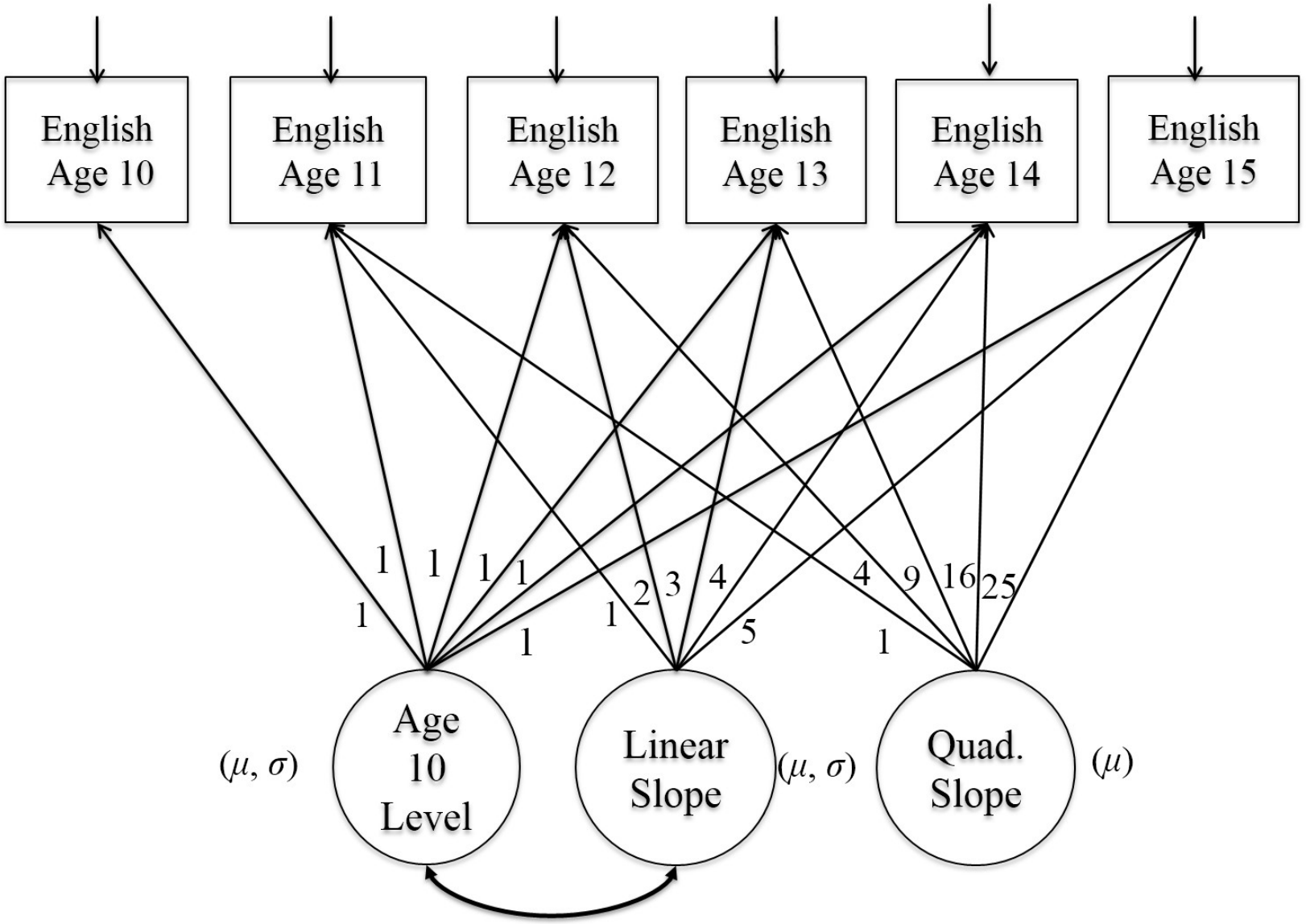


Figure 8. Example of Constrained Latent Growth Model Regressing Growth Parameters On Covariates

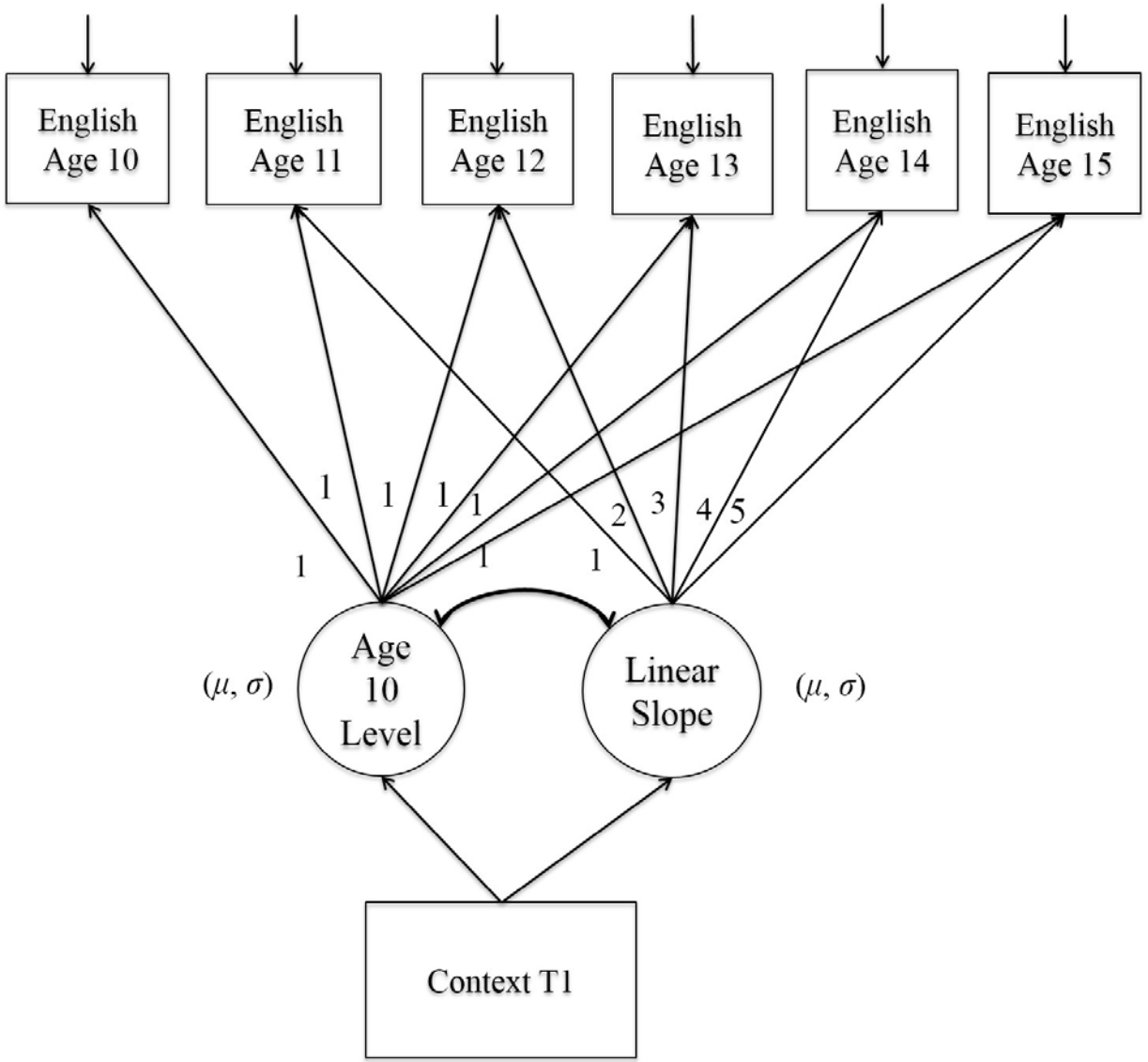


Figure 9. Example of Substance Use Intentions (Specified as Zero Inflation Model) Regressed on English Use LGM Parameters

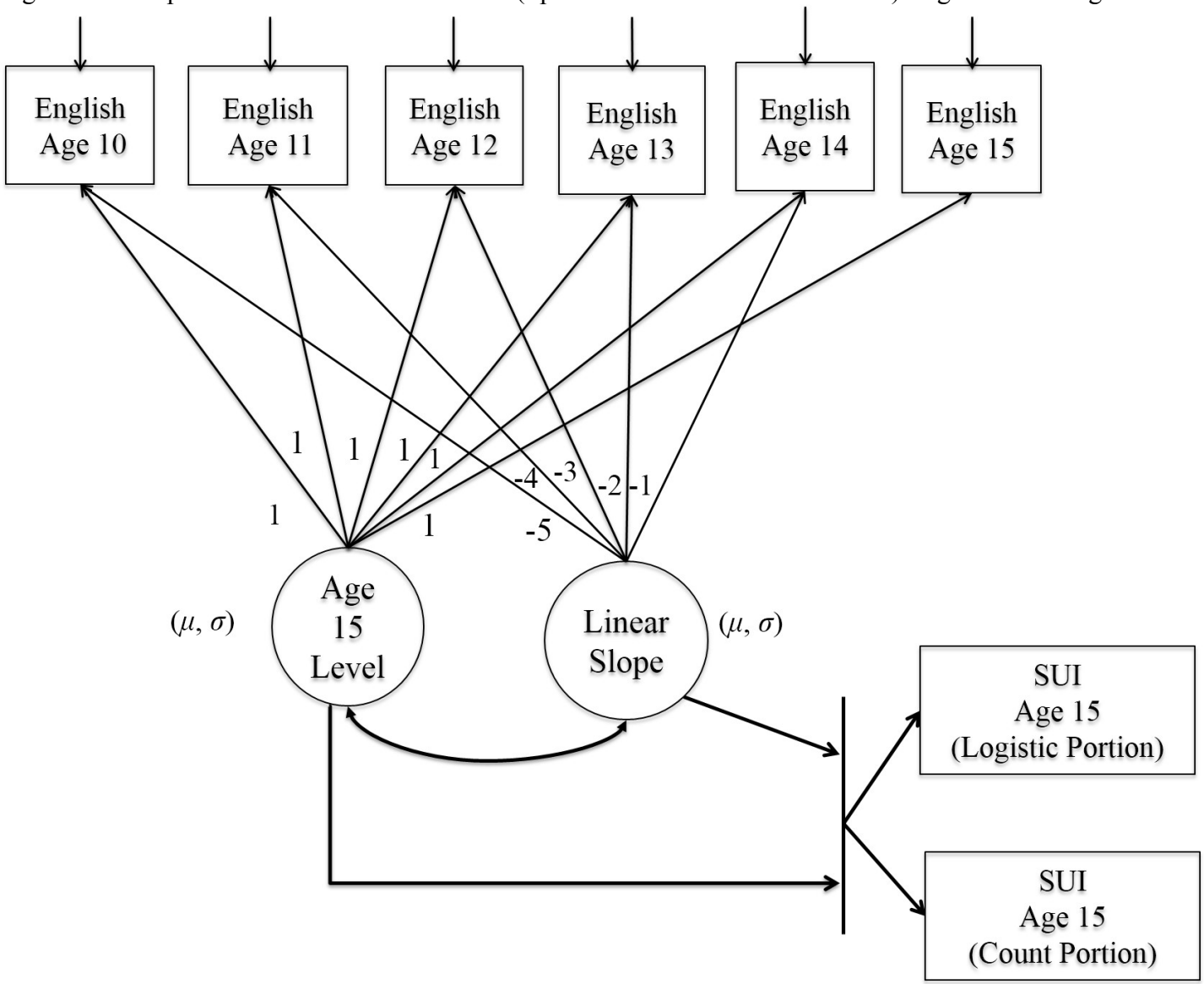


Figure 10. Example of Parallel Process Growth Model Illustrating Links Between English and Any Substance Use Intentions Growth Parameters

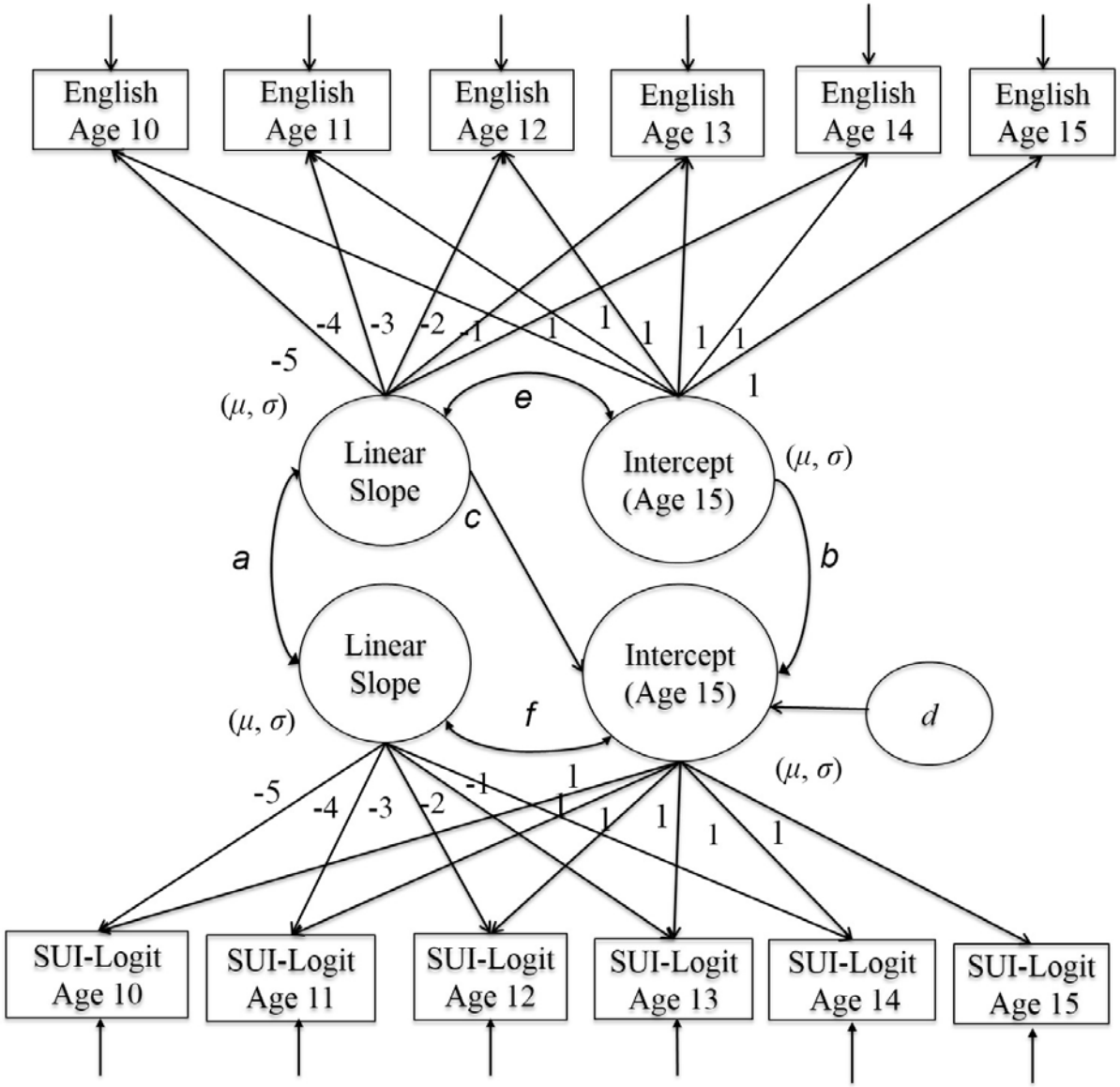


Figure 11. Example of Full (Five Wave) Latent Growth Mediation Model for English Use, Parent Warmth, and Substance Use Intentions

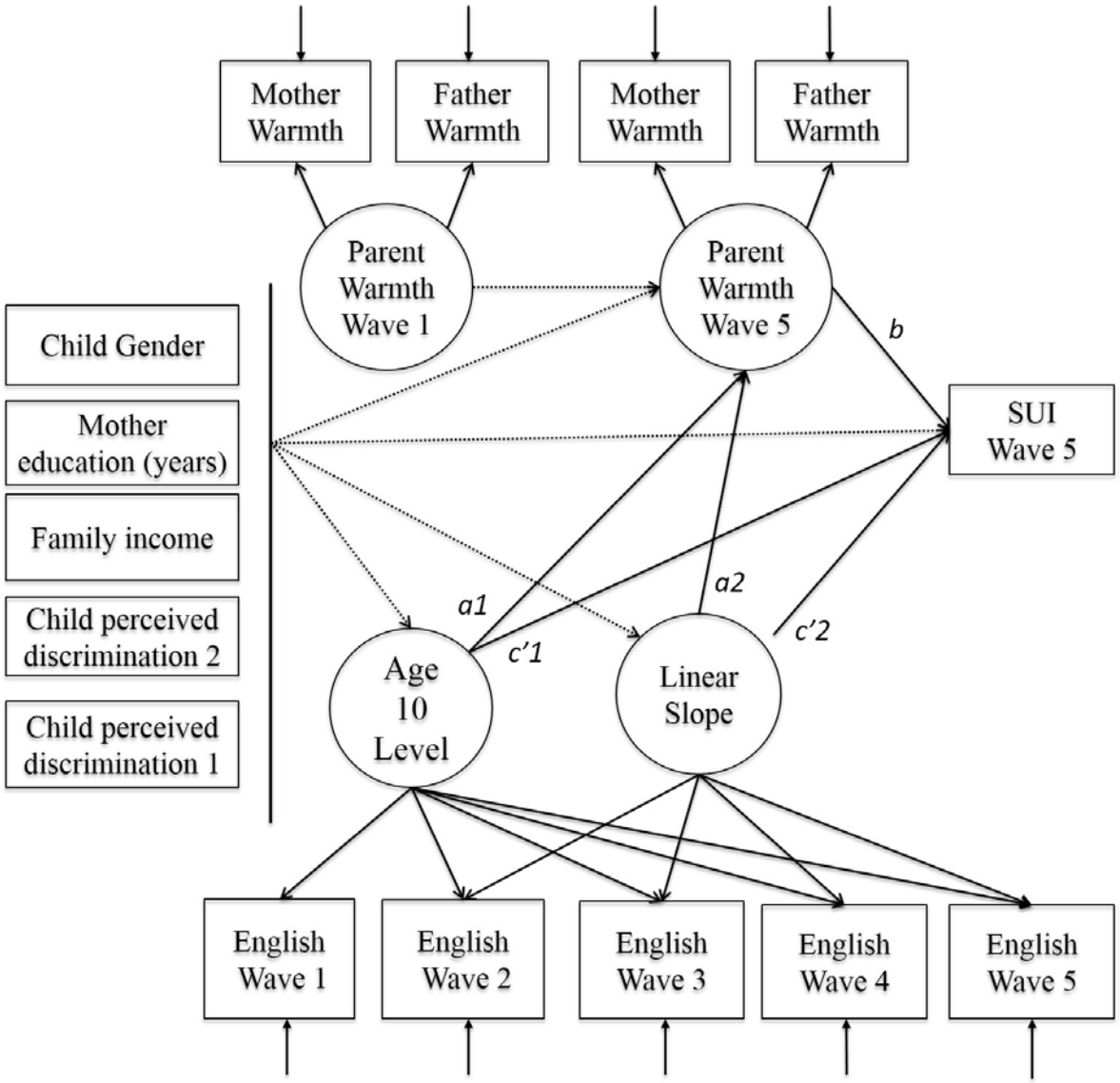


Figure 12. Example of Full (Three Wave) Latent Growth Mediation Model for American Cultural Values, Parent Warmth, and Substance Use Intentions

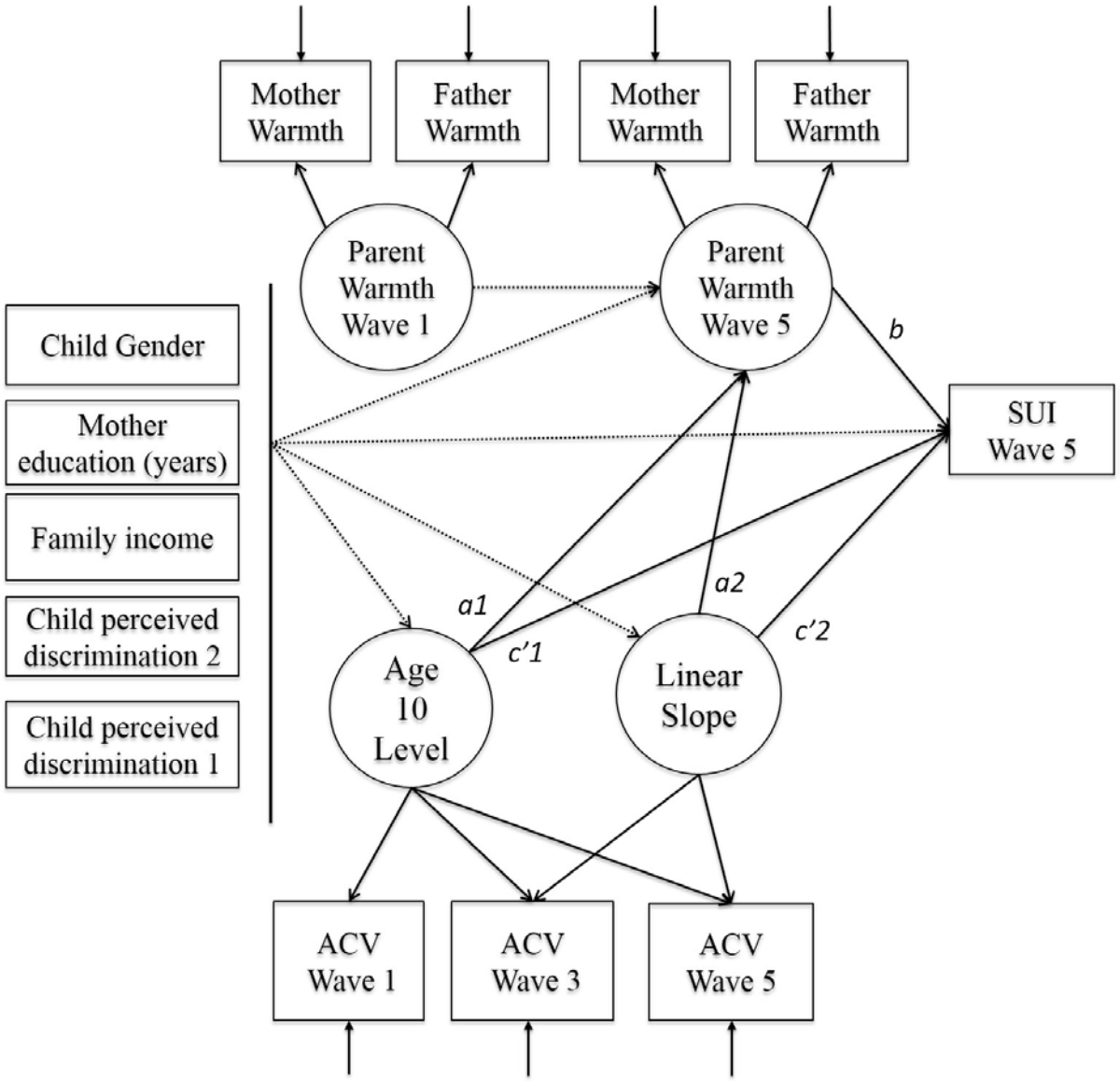


Figure 13. Box and Whisker Plot of English Use Distribution Across Ages Ten to Fifteen

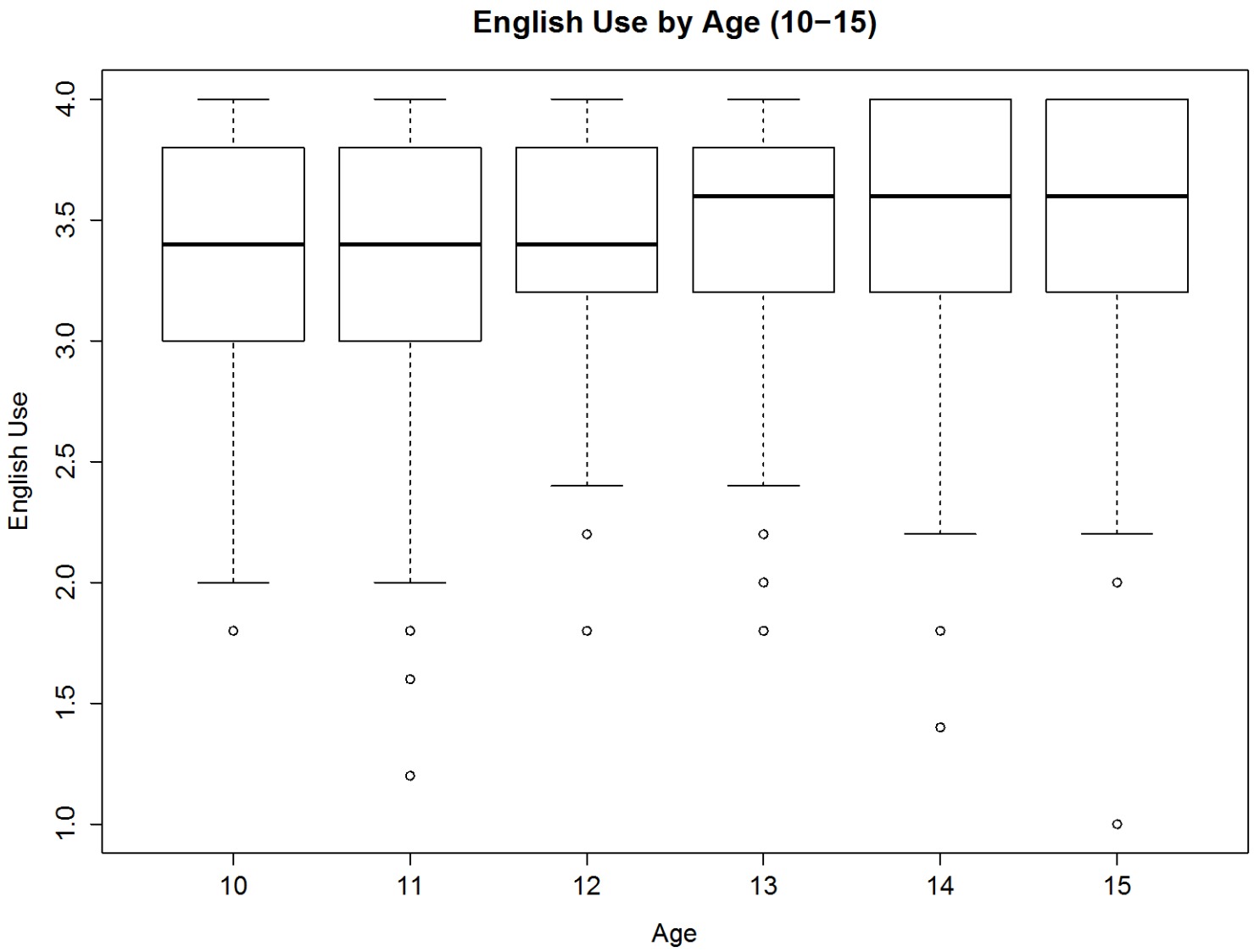


Figure 14. Box and Whisker Plot of American Cultural values Distribution Across Ages Ten to Fifteen

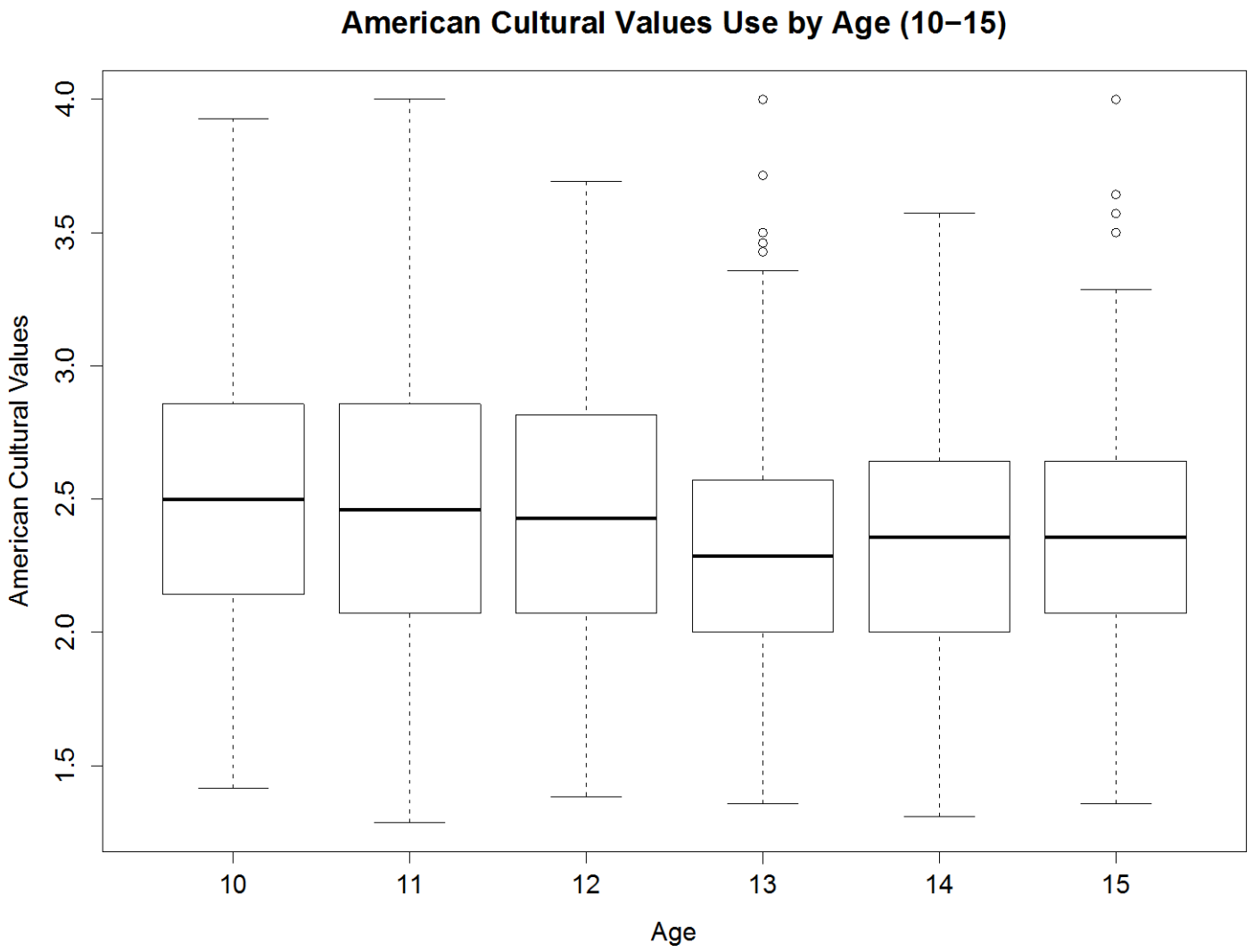


Figure 15. Box and Whisker Plot of Spanish Use Distribution Across Ages Ten to Fifteen

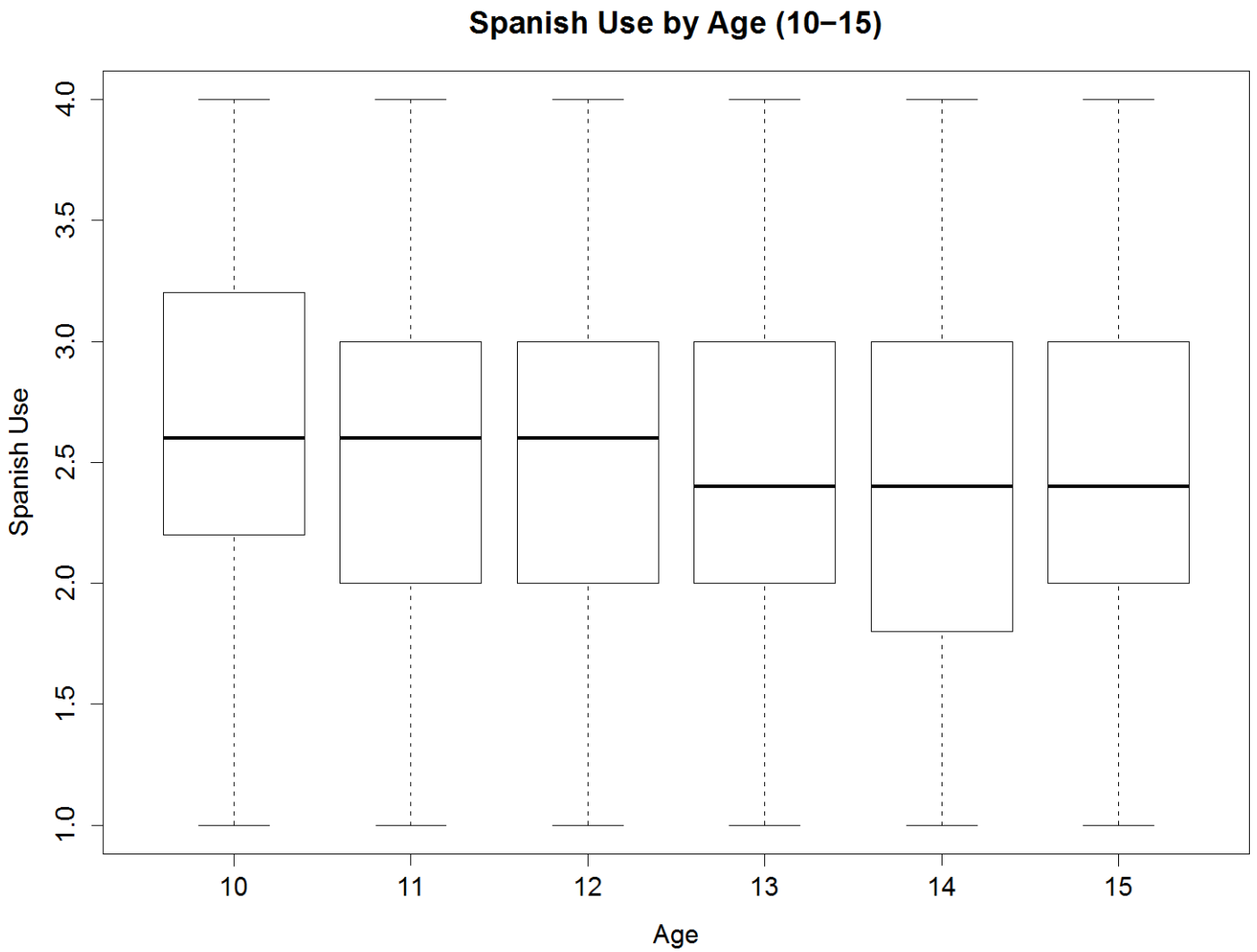


Figure 16. Box and Whisker Plot of Mexican Cultural Values Distribution Across Ages Ten to Fifteen

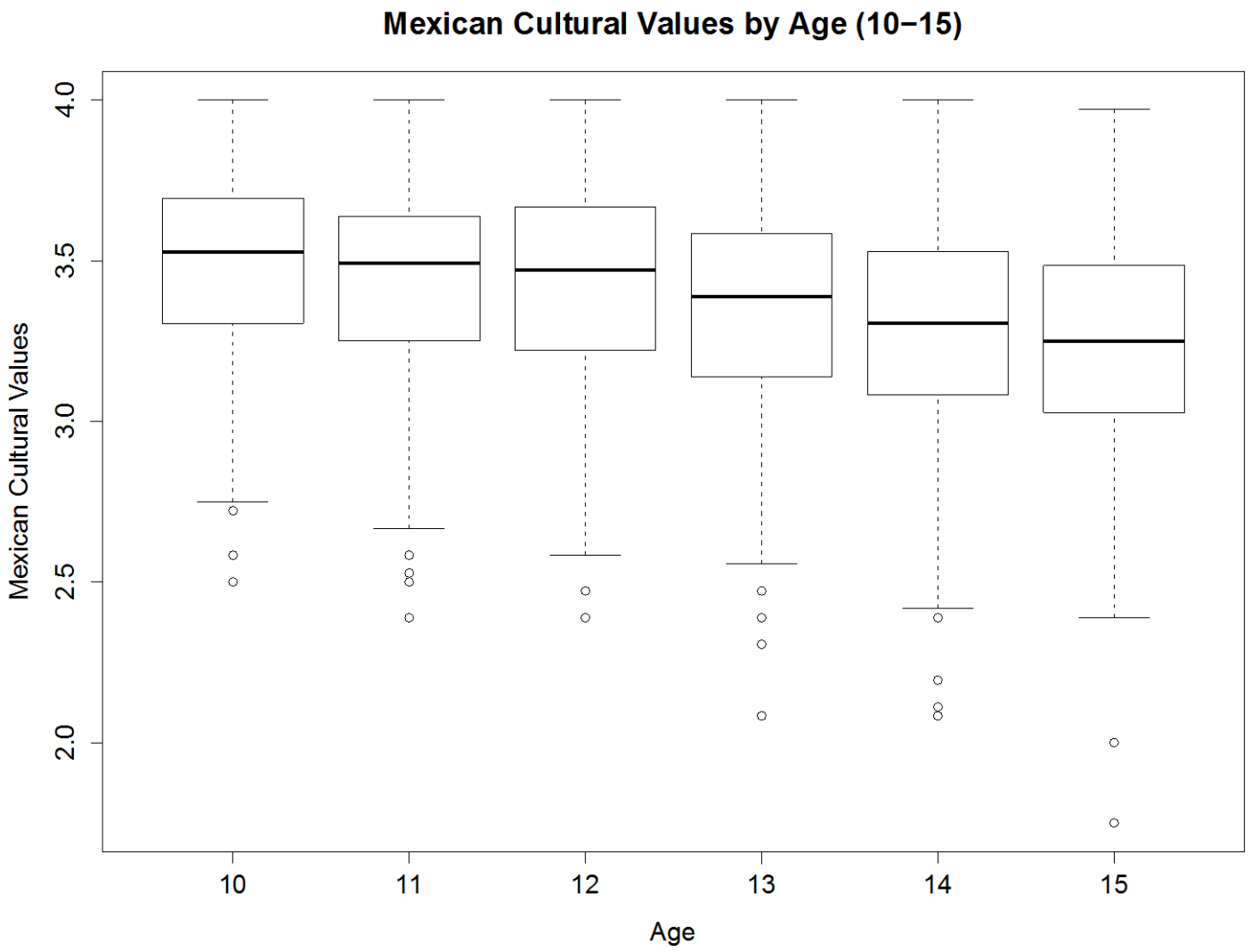


Figure 17. Box and Whisker Plot of Traditional Family Values Distribution Across Ages Ten to Fifteen

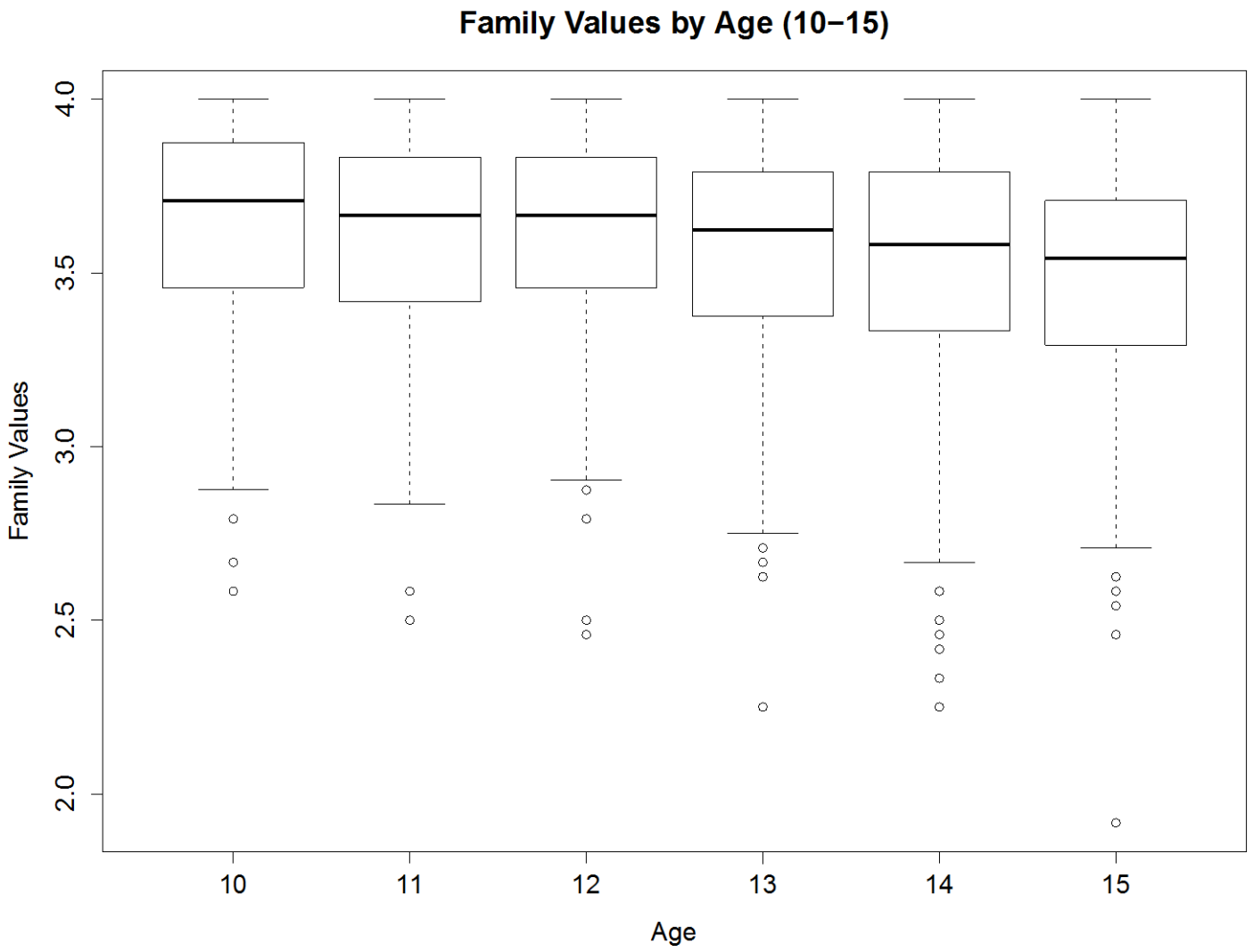


Figure 18. Box and Whisker Plot of Mexican-American Ethnic Pride Distribution Across Ages Ten to Fifteen

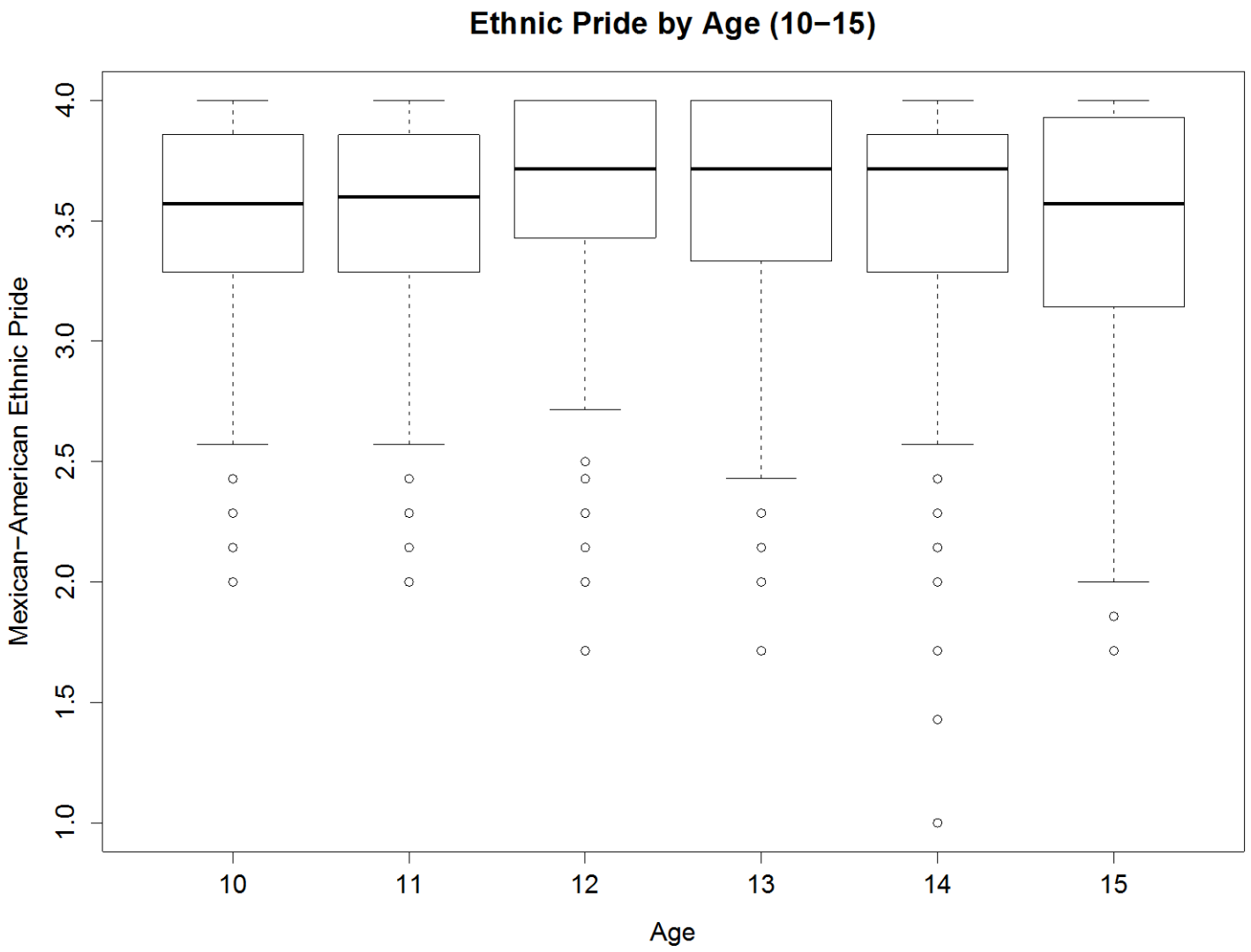


Figure 19. Heatmap Correlation Matrix for Cultural Variables by Wave

Figure 20. English Use LGM Estimated Linear Growth with Observed Means

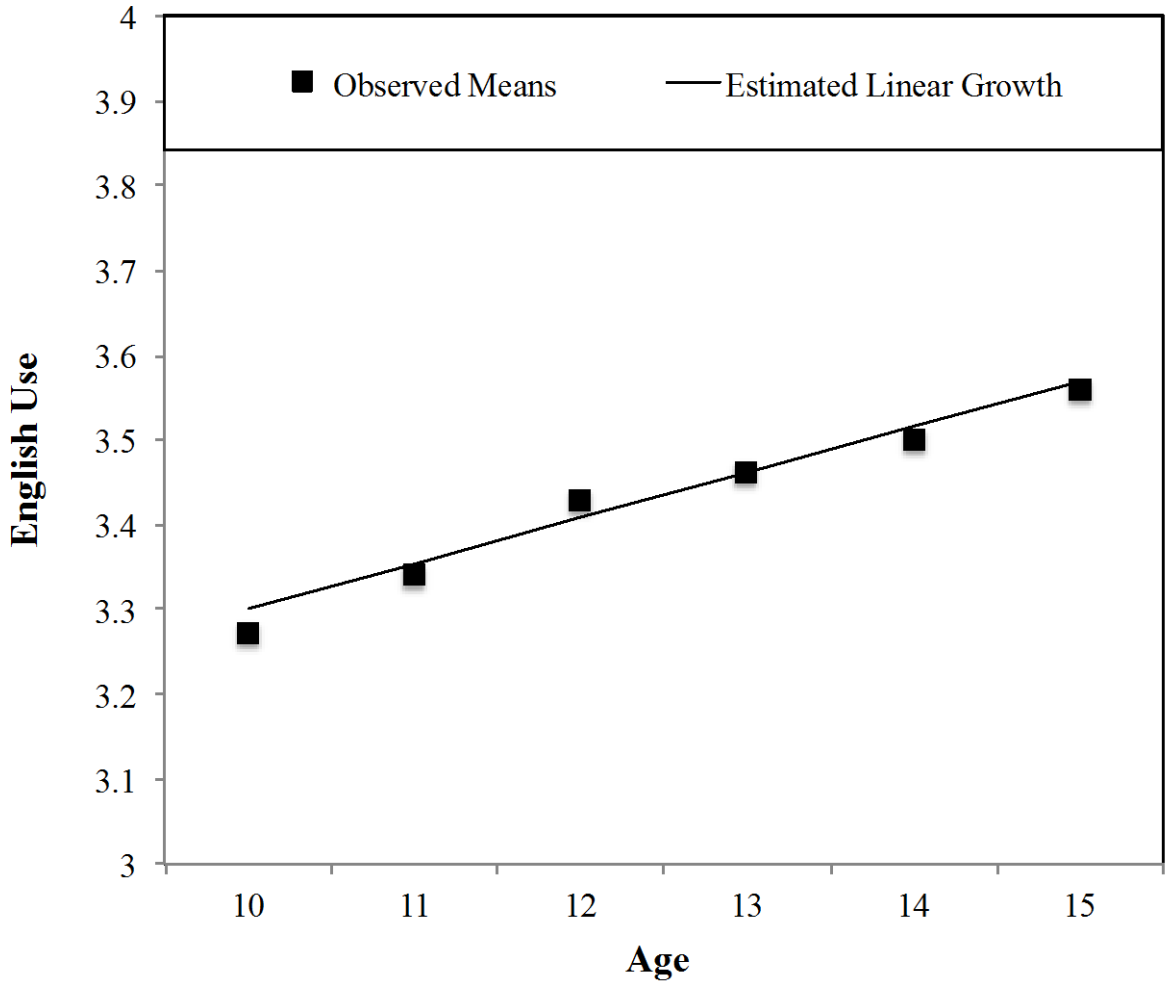


Figure 21. Predicted English use growth curves at low, medium, and high initial values, demonstrating association between intercept and slope.

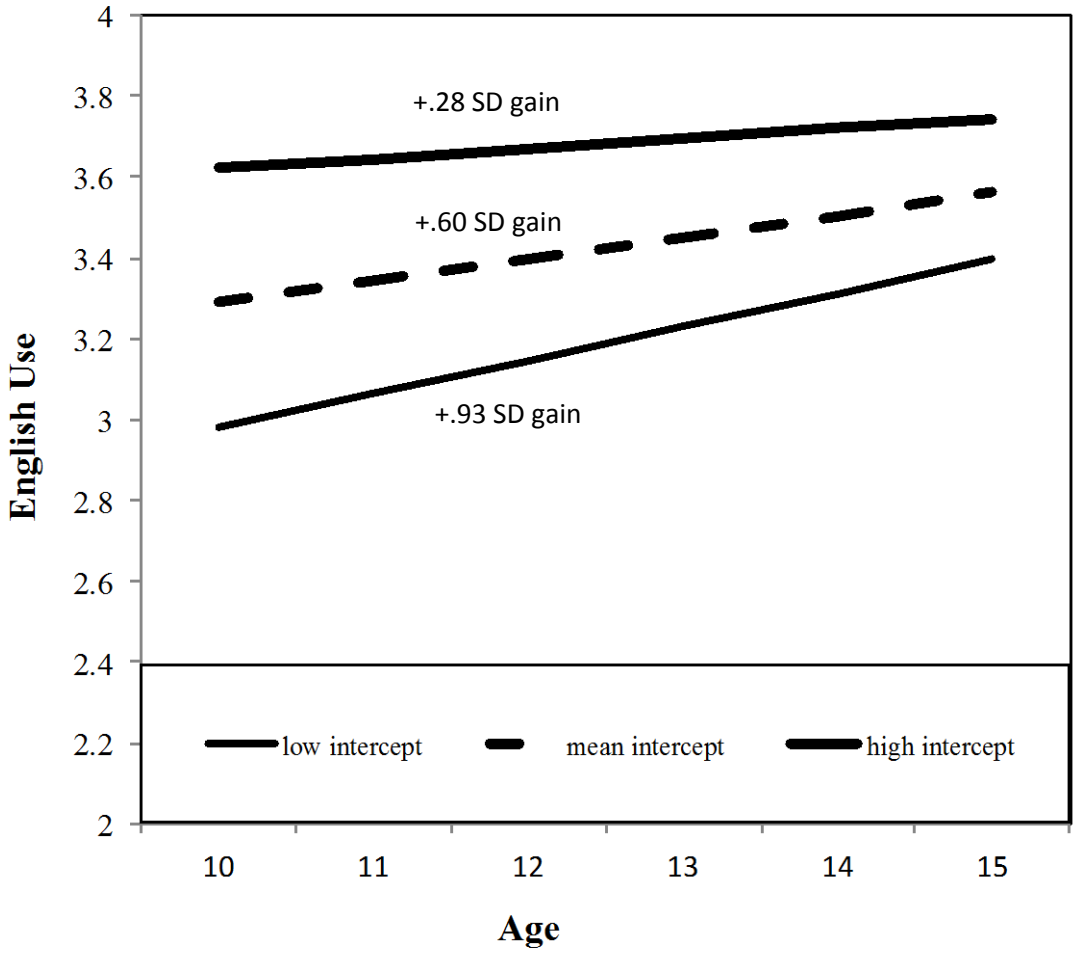


Figure 22. English use quadratic model from multi-level model analysis

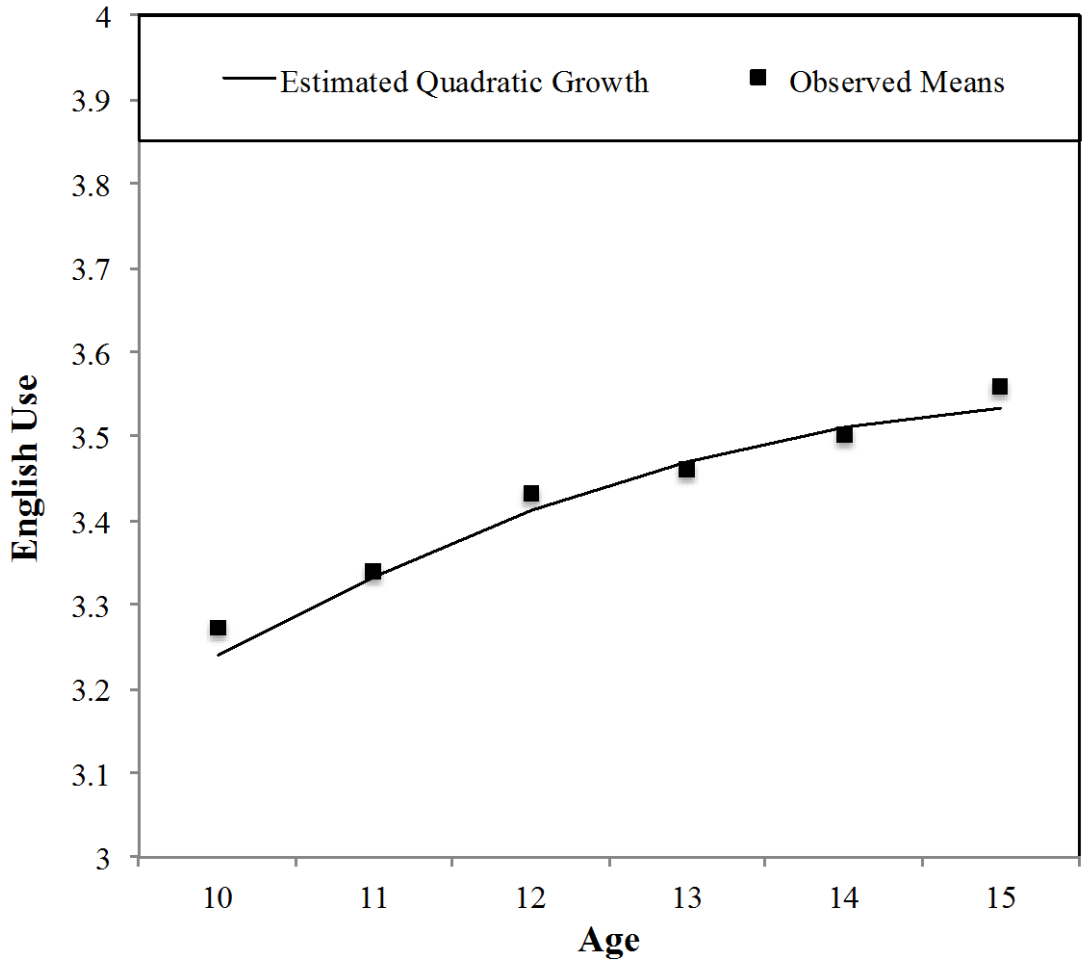


Figure 23. American Cultural Values LGM Estimated Quadratic Curve for Males and Females with Observed Means

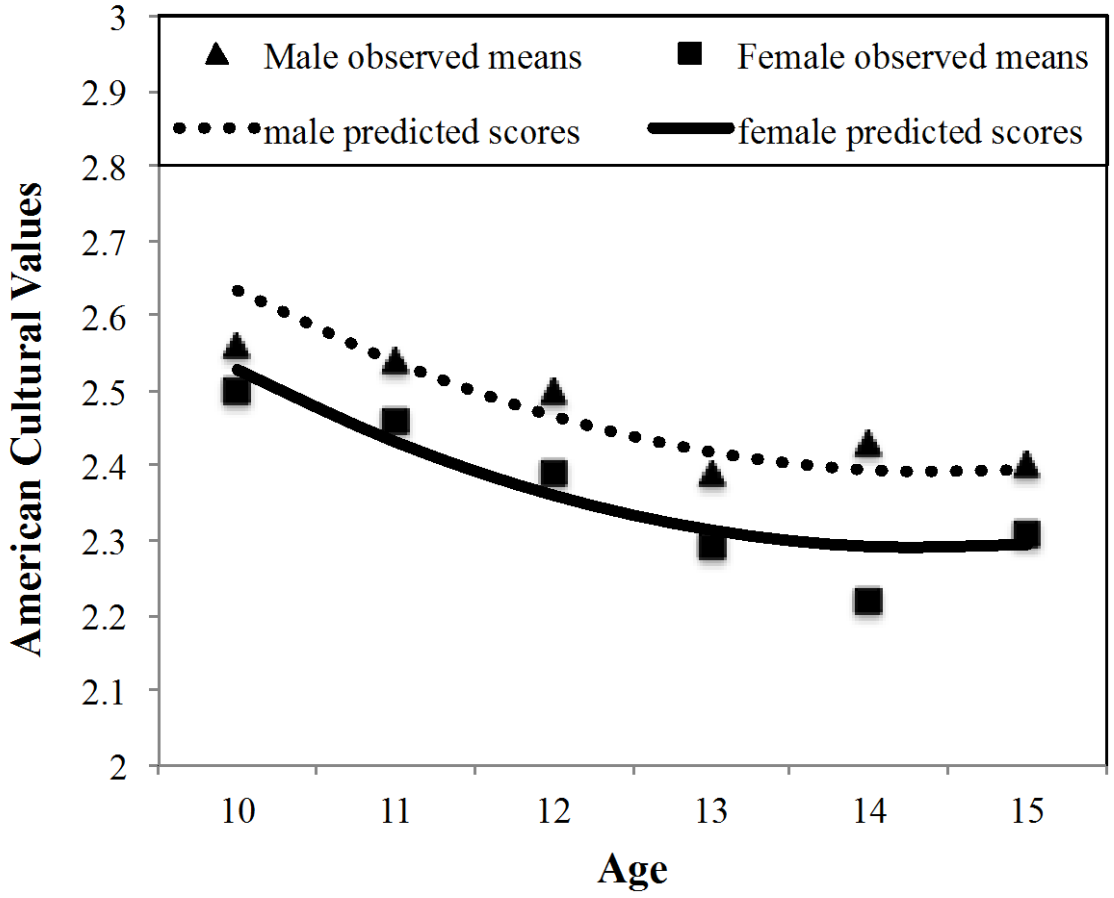


Figure 24. Predicted ACV linear growth curves at low, medium, and high initial values, demonstrating association between intercept and slope.

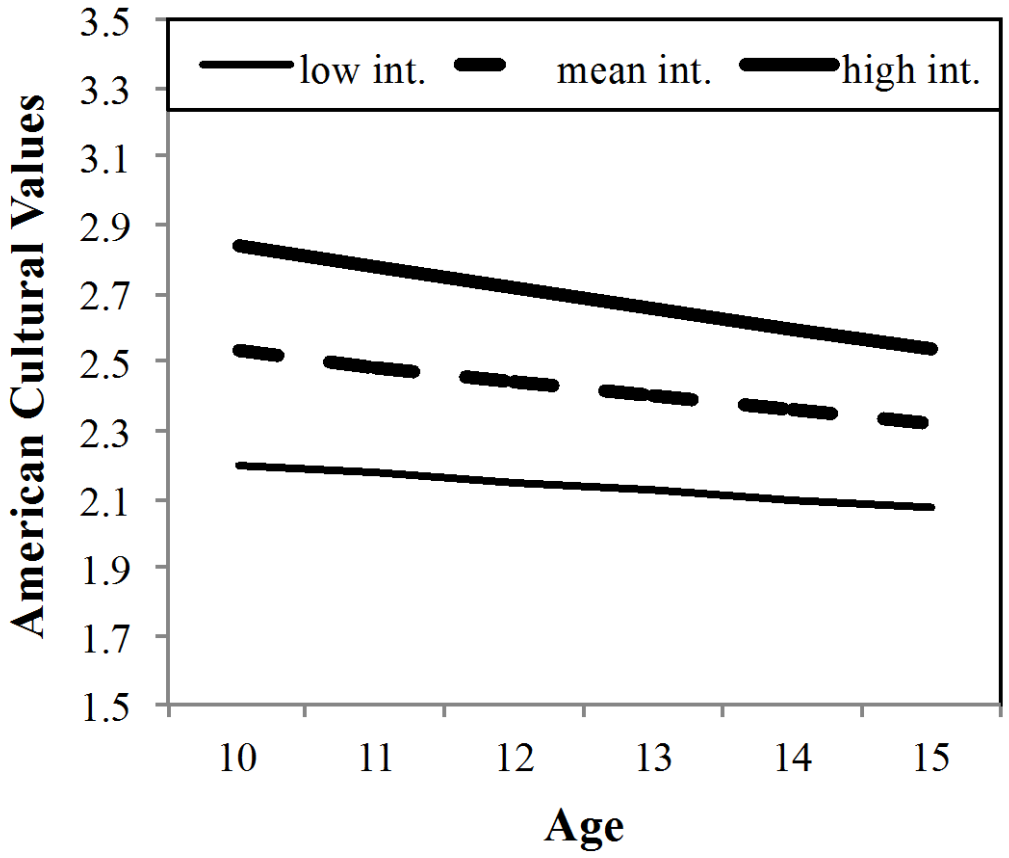


Figure 25. Spanish Use LGM Estimated Quadratic Curves for Males and Females with Observed Means

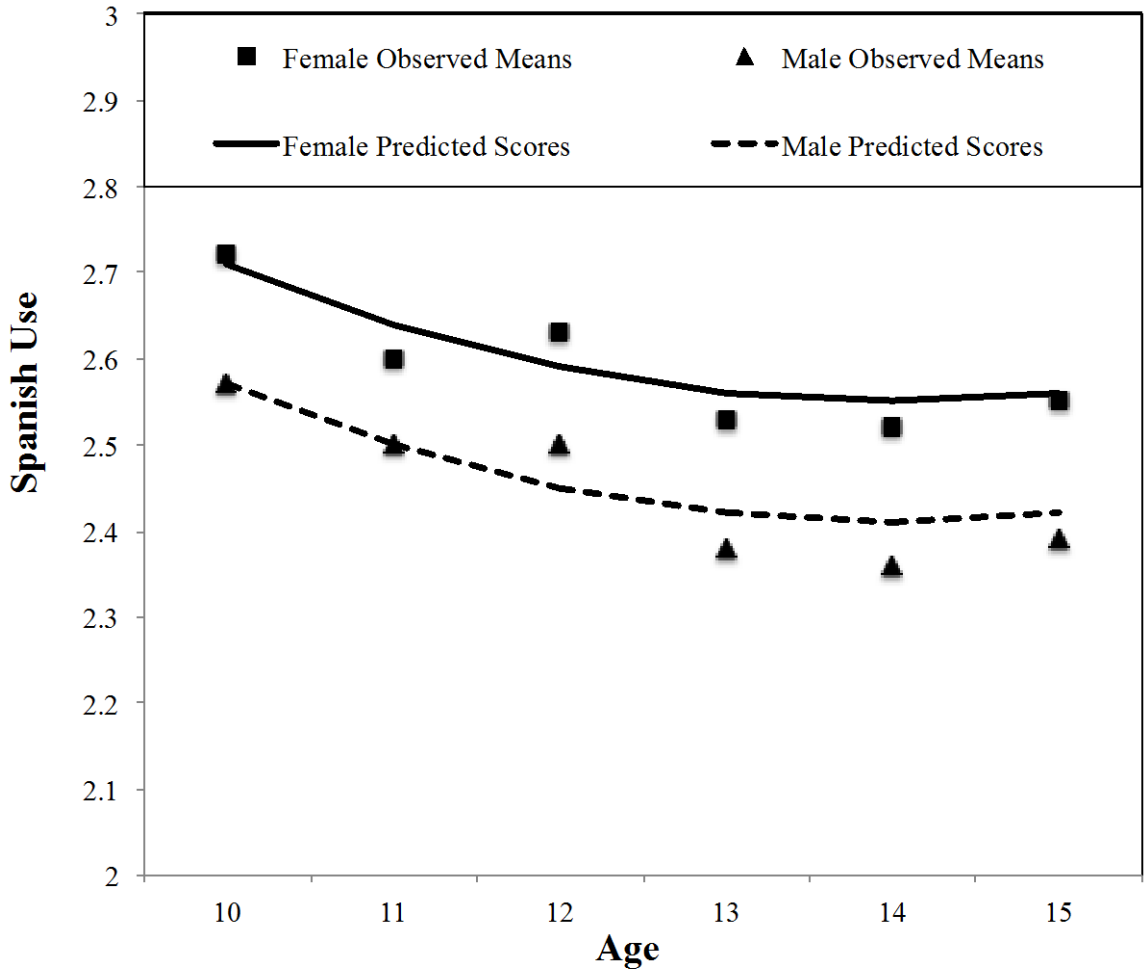


Figure 26. Predicted Spanish use linear growth curves at low, medium, and high initial values, demonstrating association between intercept and slope.

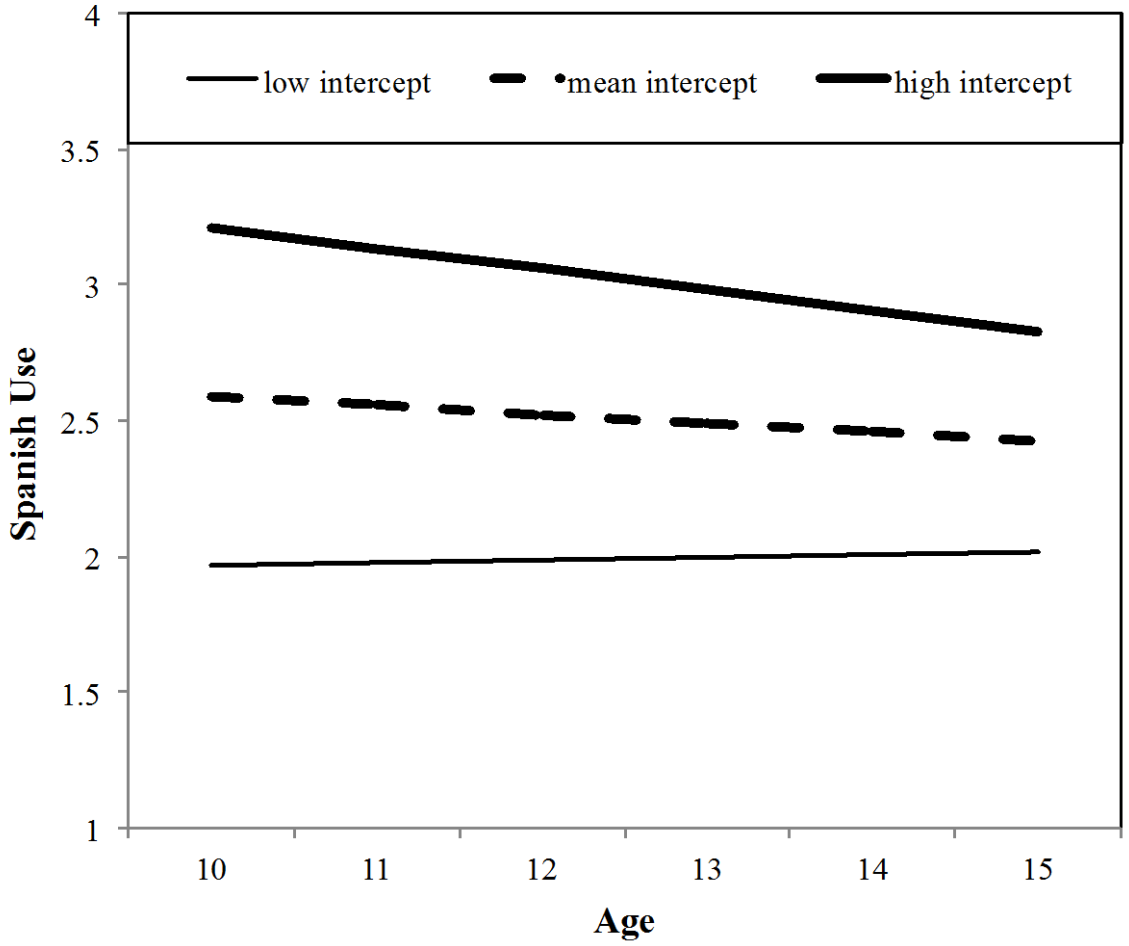


Figure 27. Mexican Cultural Values LGM Estimated Linear Curve with Observed Means

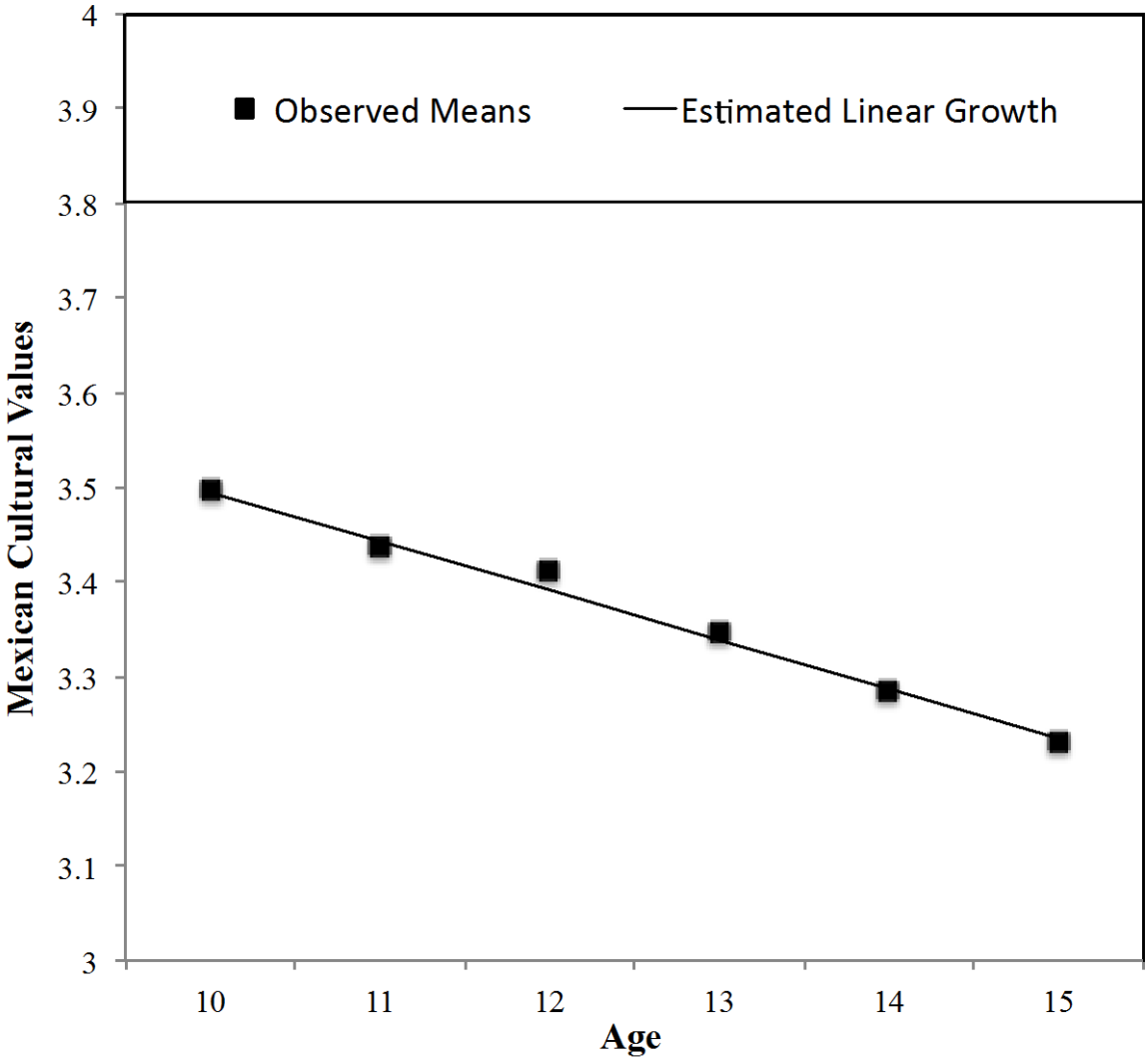


Figure 28. Traditional Family Values LGM Estimated Quadratic Curve with Observed Means

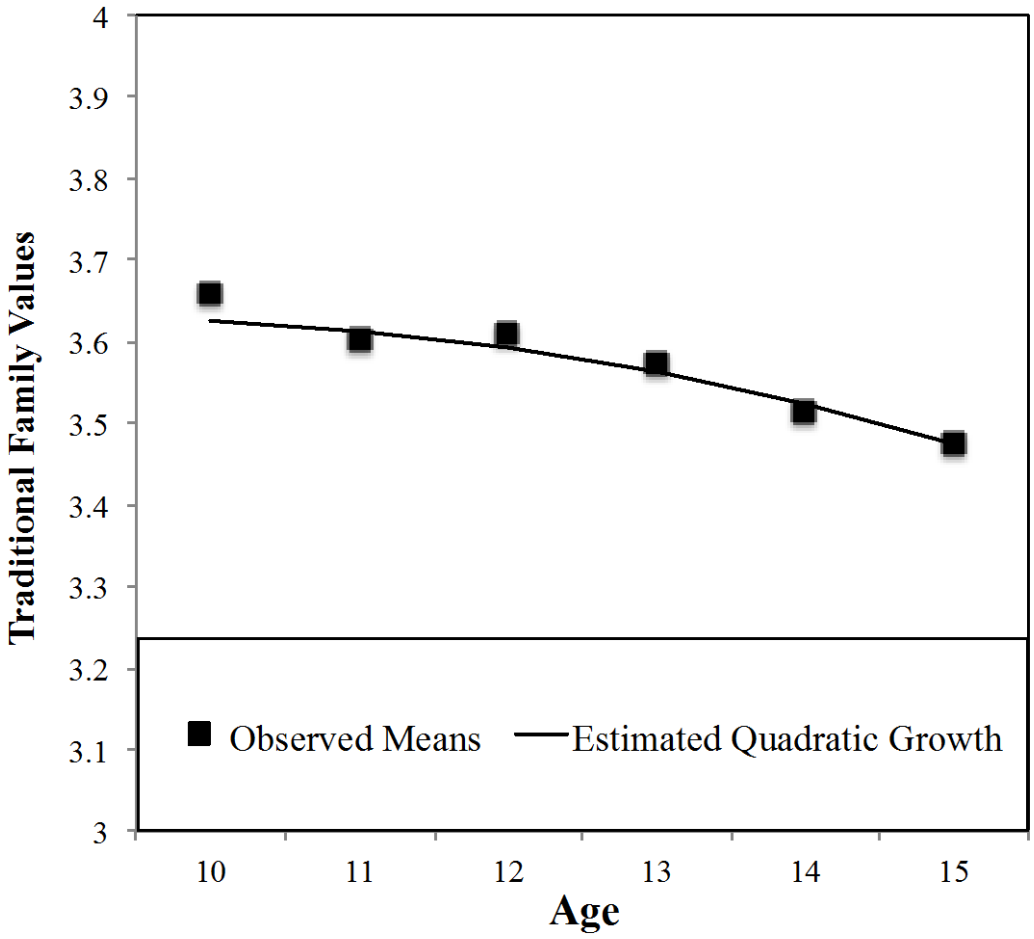


Figure 29. Mexican-American Ethnic Pride LGM Estimated Quadratic Curves for Males and Females with Observed Means

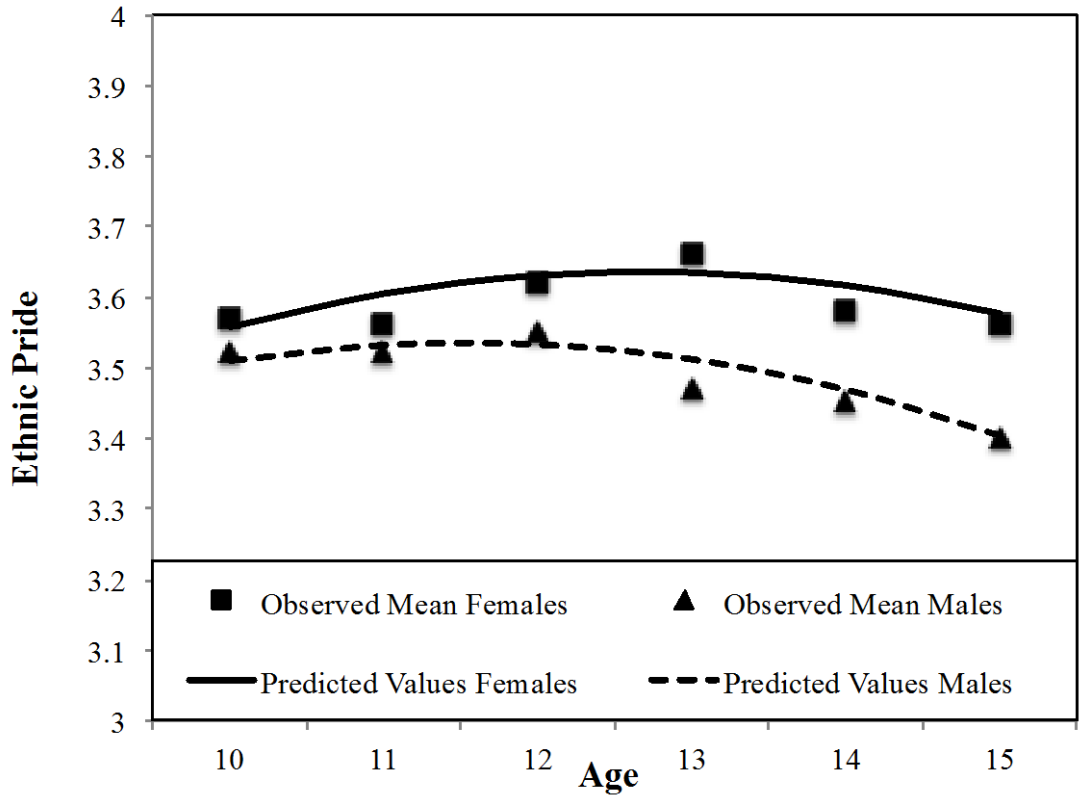


Figure 30. Scatterplot of Random Intercept and Slope Estimates for English Use Derived from LGM (Mplus) and Multilevel Model (R)

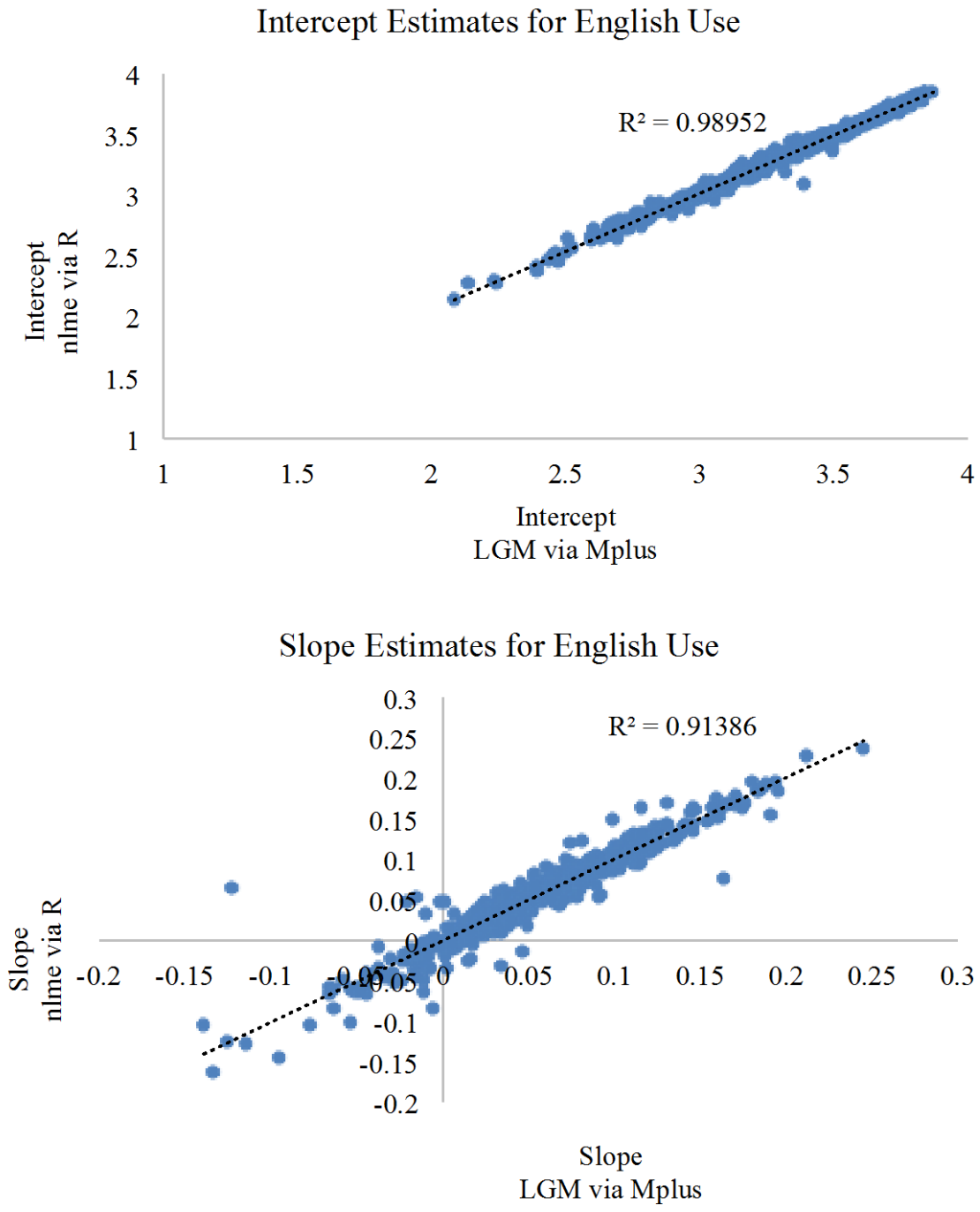
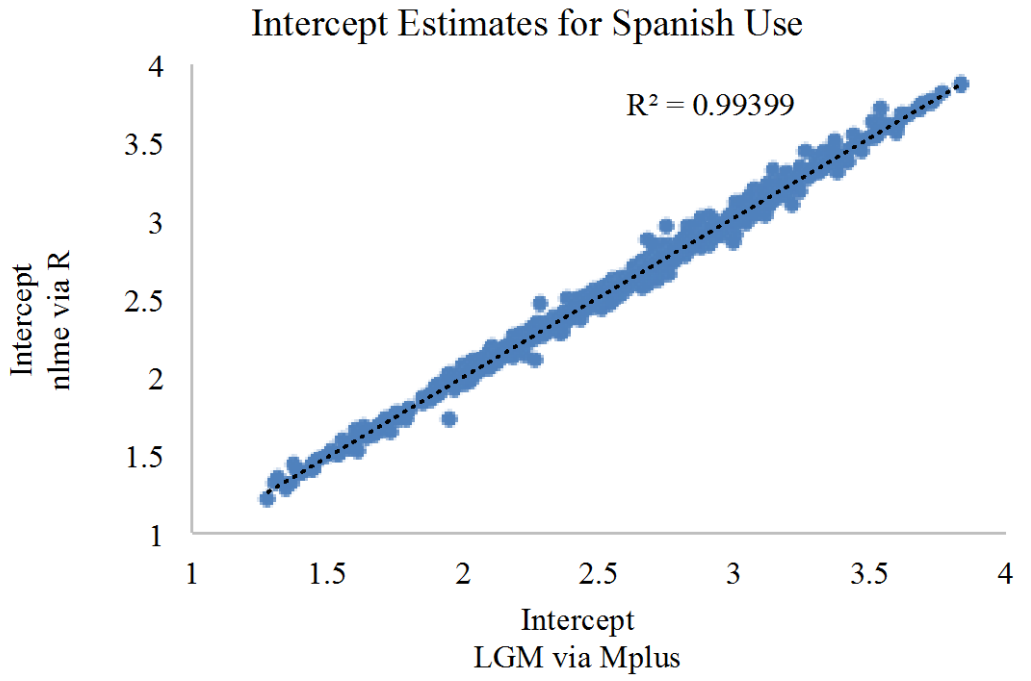


Figure 31. Scatterplot of Random Intercept and Slope Estimates for Spanish Use Derived from LGM (Mplus) and Multilevel Model (R)



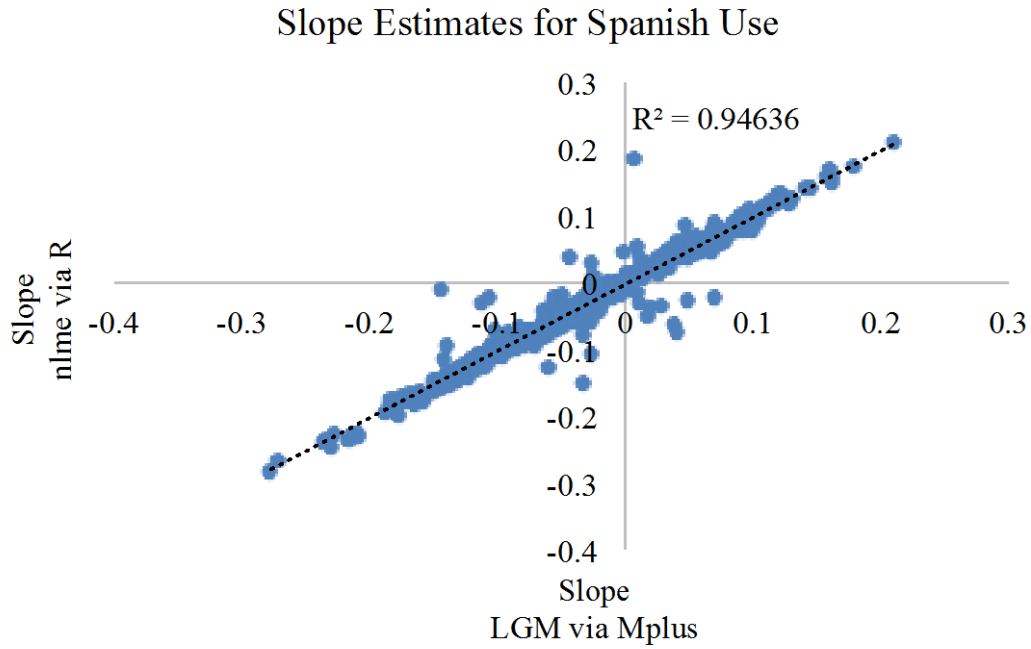


Figure 32. Scatterplot of Random Intercept and Slope Estimates for American Cultural Values Derived from LGM (Mplus) and Multilevel Model (R)

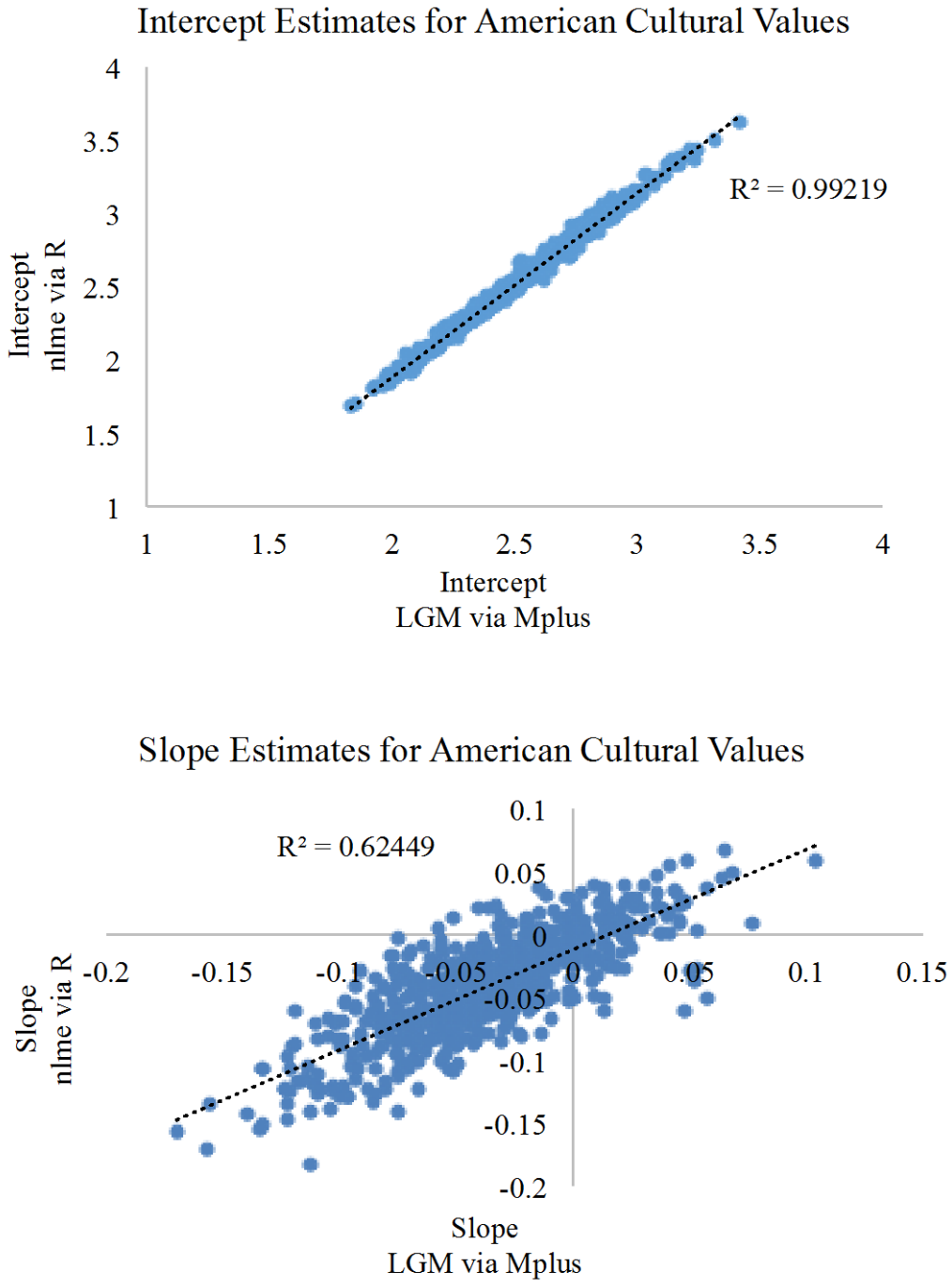
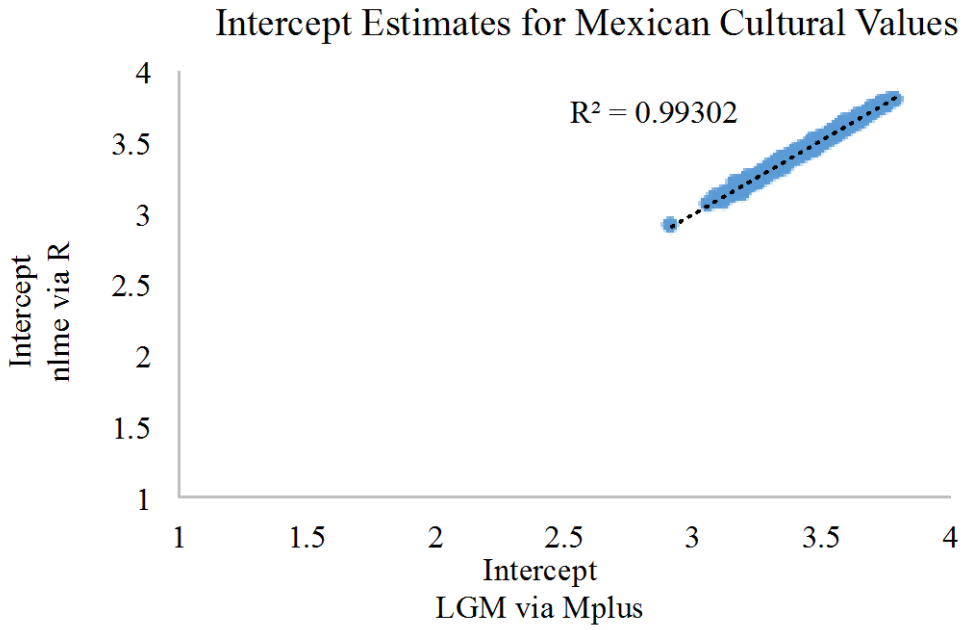


Figure 33. Scatterplot of Random Intercept and Slope Estimates for Mexican Cultural Values Derived from LGM (Mplus) and Multilevel Model (R)



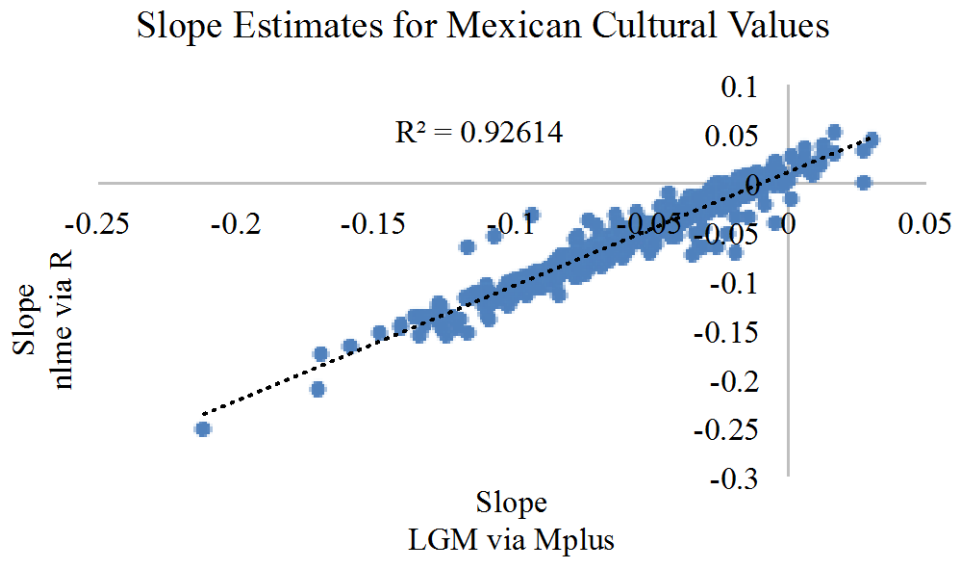


Figure 34. Scatterplot of Random Intercept and Slope Estimates for Traditional Family Values Derived from LGM (Mplus) and Multilevel Model (R)

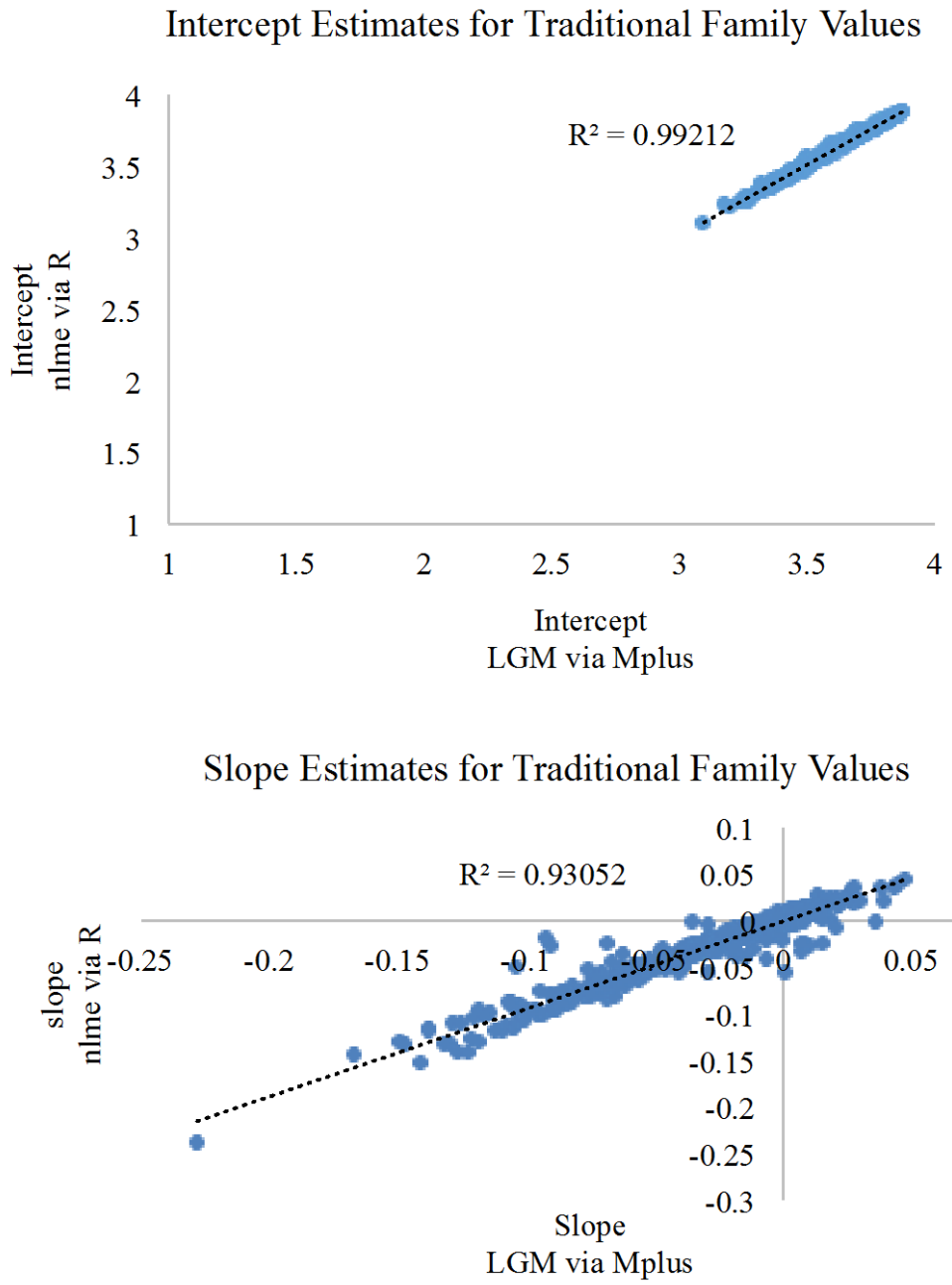


Figure 35. Scatterplot of Random Intercept and Slope Estimates for Mexican-American Ethnic Pride Derived from LGM (Mplus) and Multilevel Model (R)

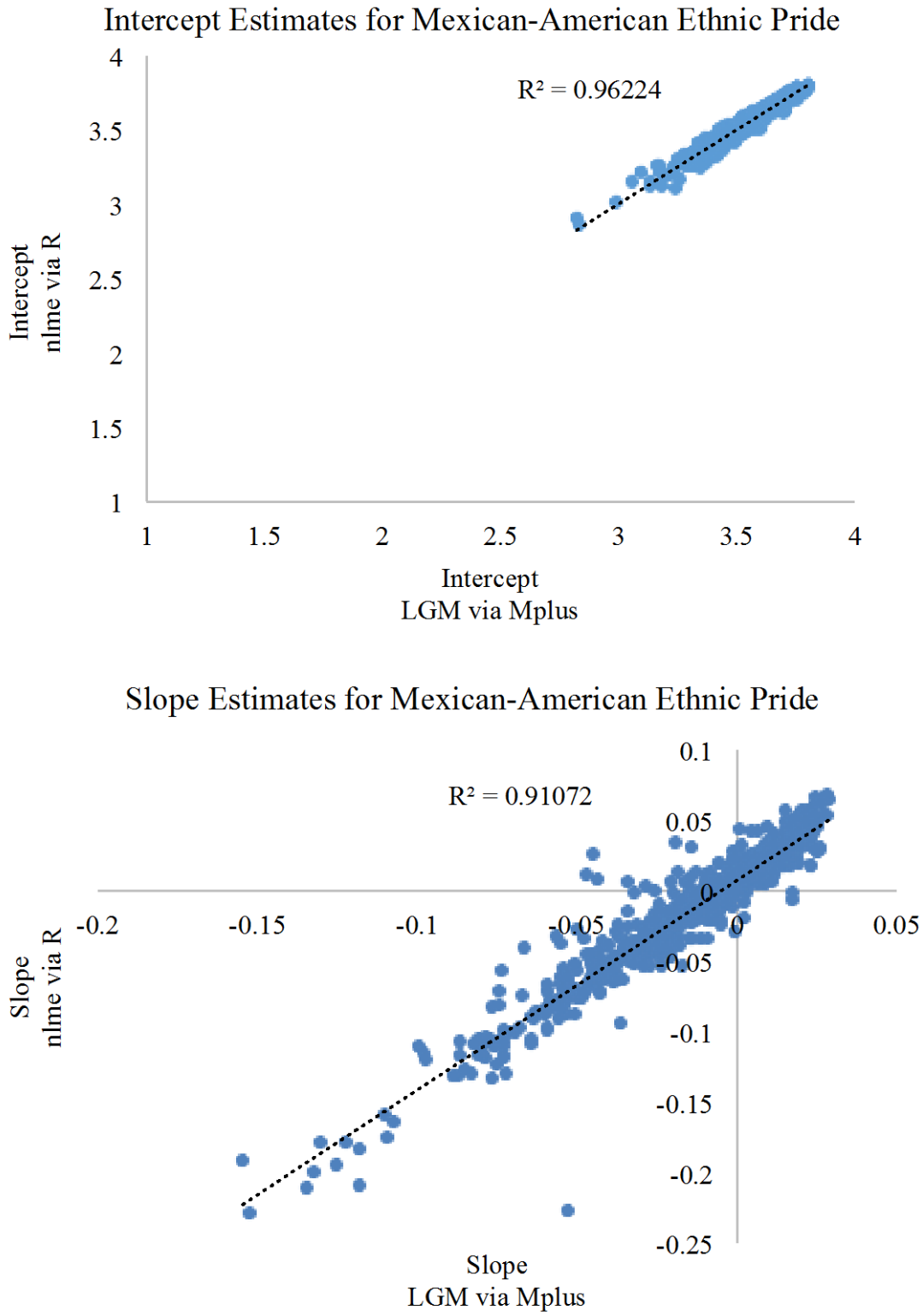


Figure 36. Forest Plot for Substance Use Intentions Specified as Continuous Outcome Variable.

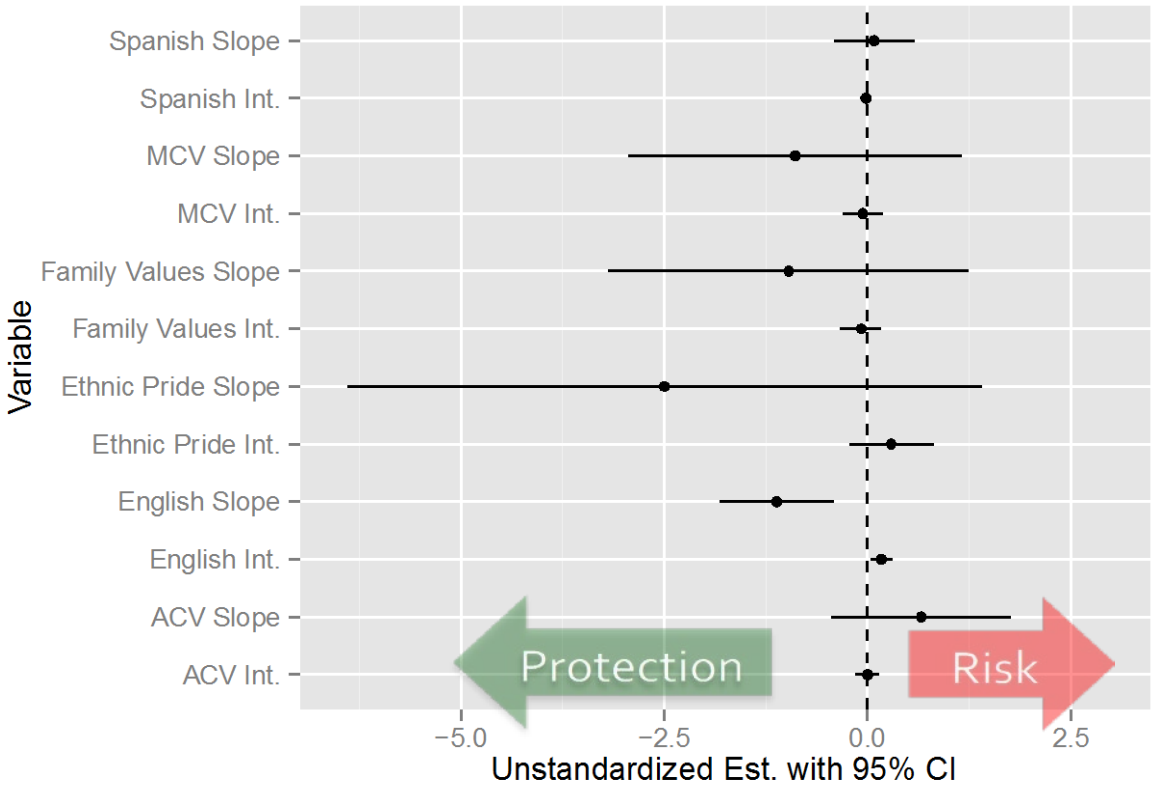


Figure 37. Substance Use Intentions – Zero Inflated Negative Binomial

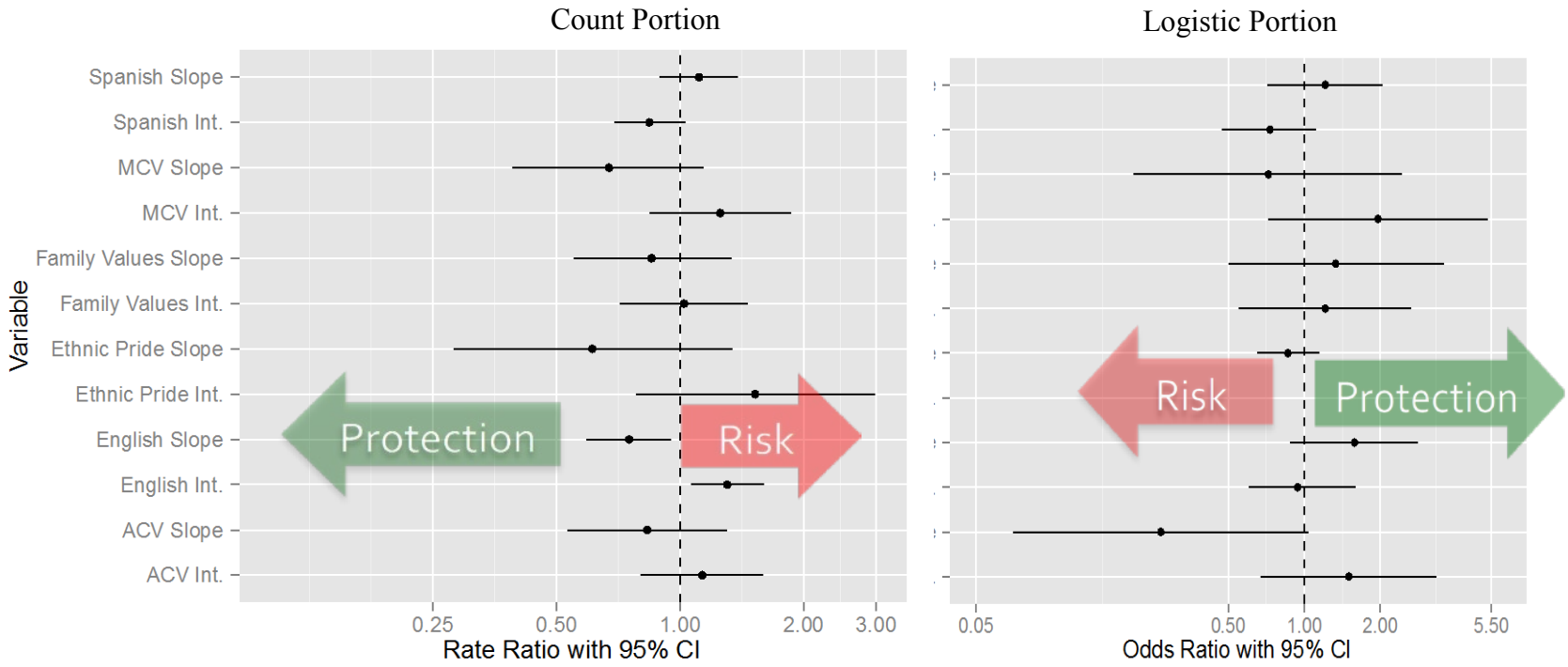


Figure 38. Predicted Substance Use Intentions by Estimated English Use Intercept and Slope-Plotted Over Observed Data

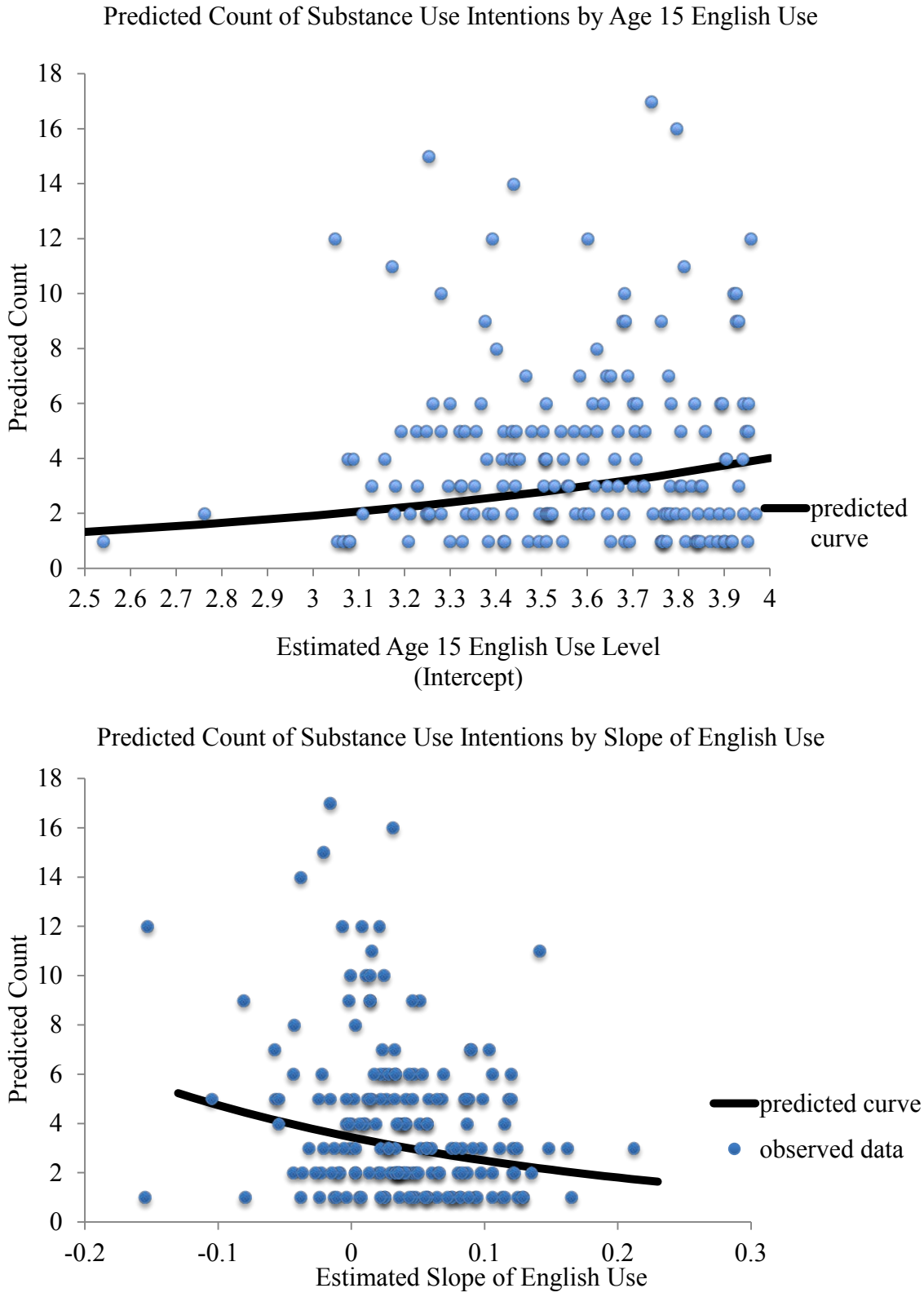


Figure 39. Predicted Probability of Any SUI by ACV Slope

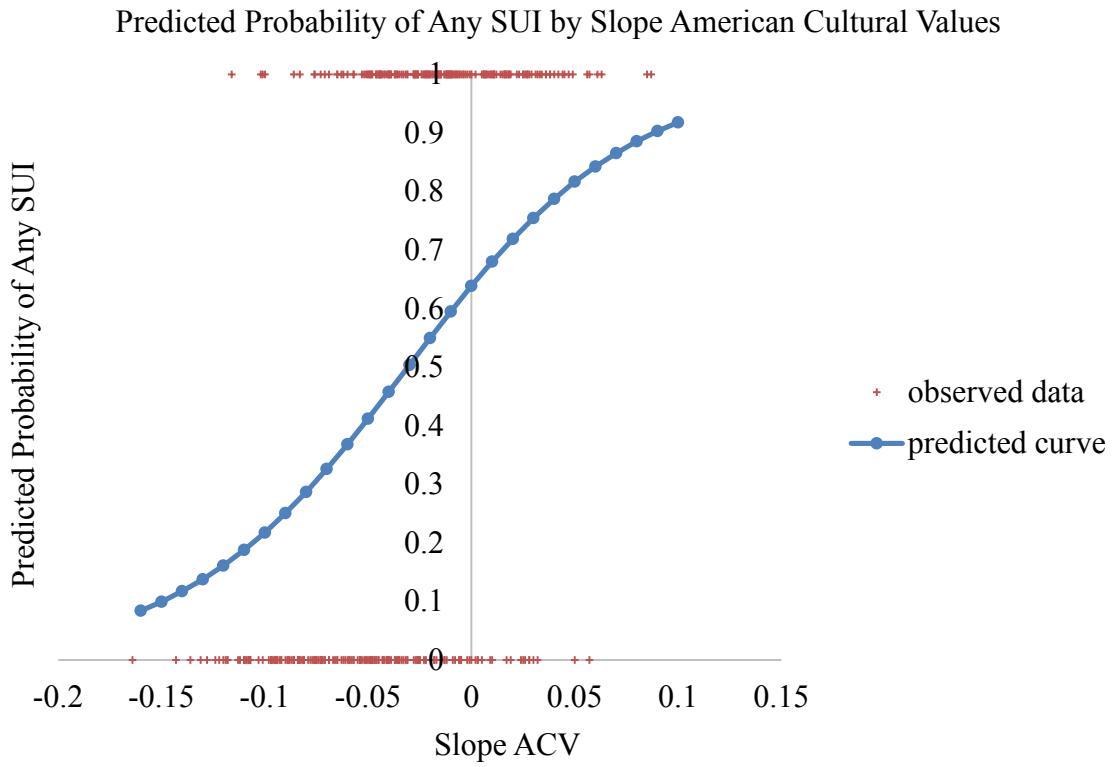


Figure 40. Predicted Count of SUI by Age 15 Spanish Use

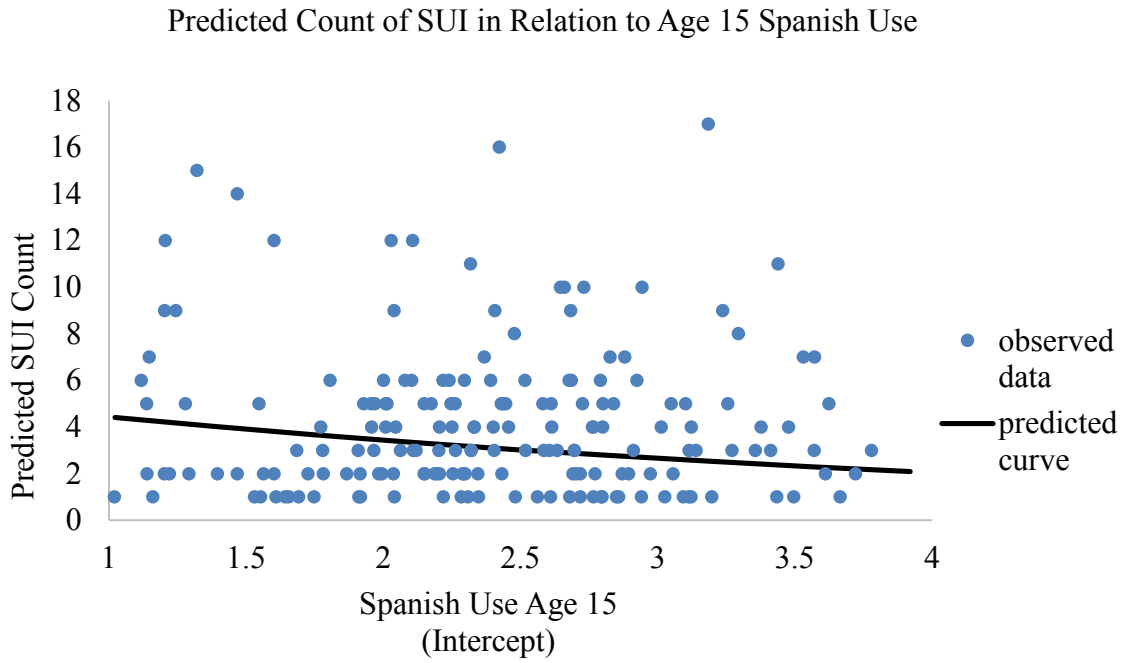


Figure 41. Plot of Predicted Count of SUI by Ethnic Pride with 95% Confidence Interval.

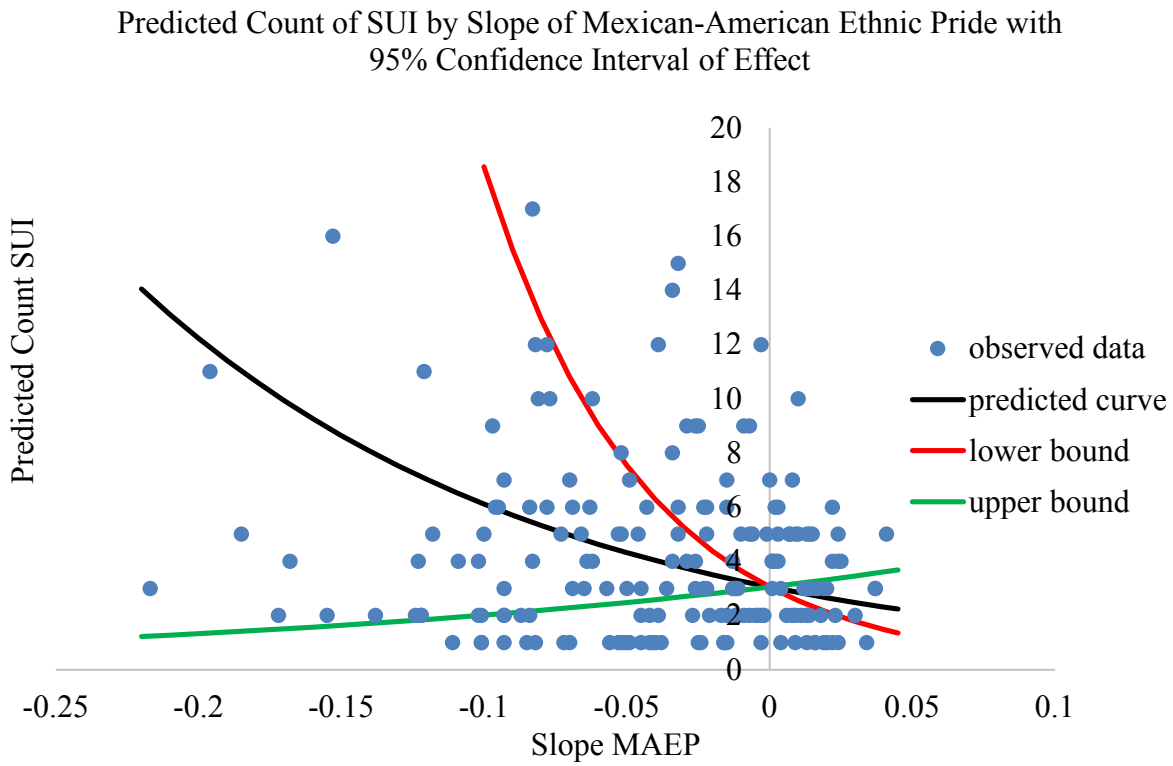


Figure 42. Plotting Predicted Probabilities from Parallel Process Growth Model for English Use.

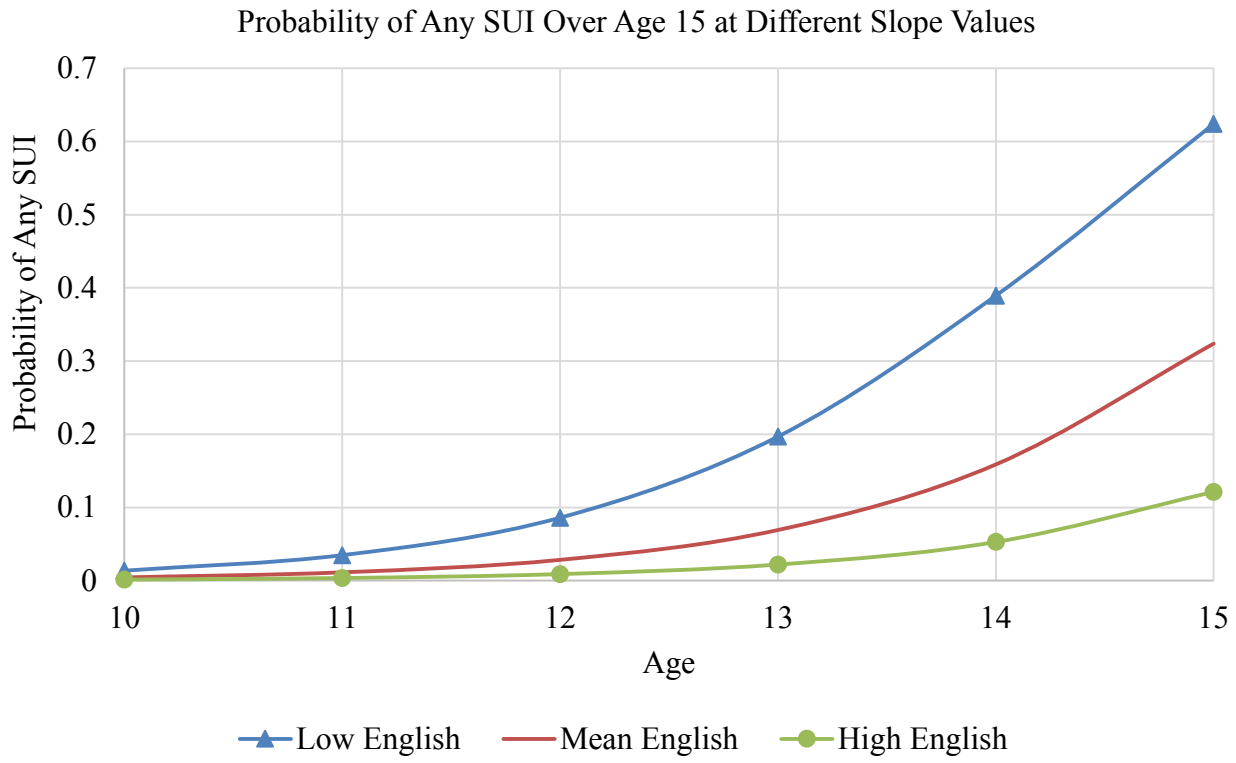


Figure 43. Plotting Predicted Probabilities from Parallel Process Growth Model for American Cultural Values.

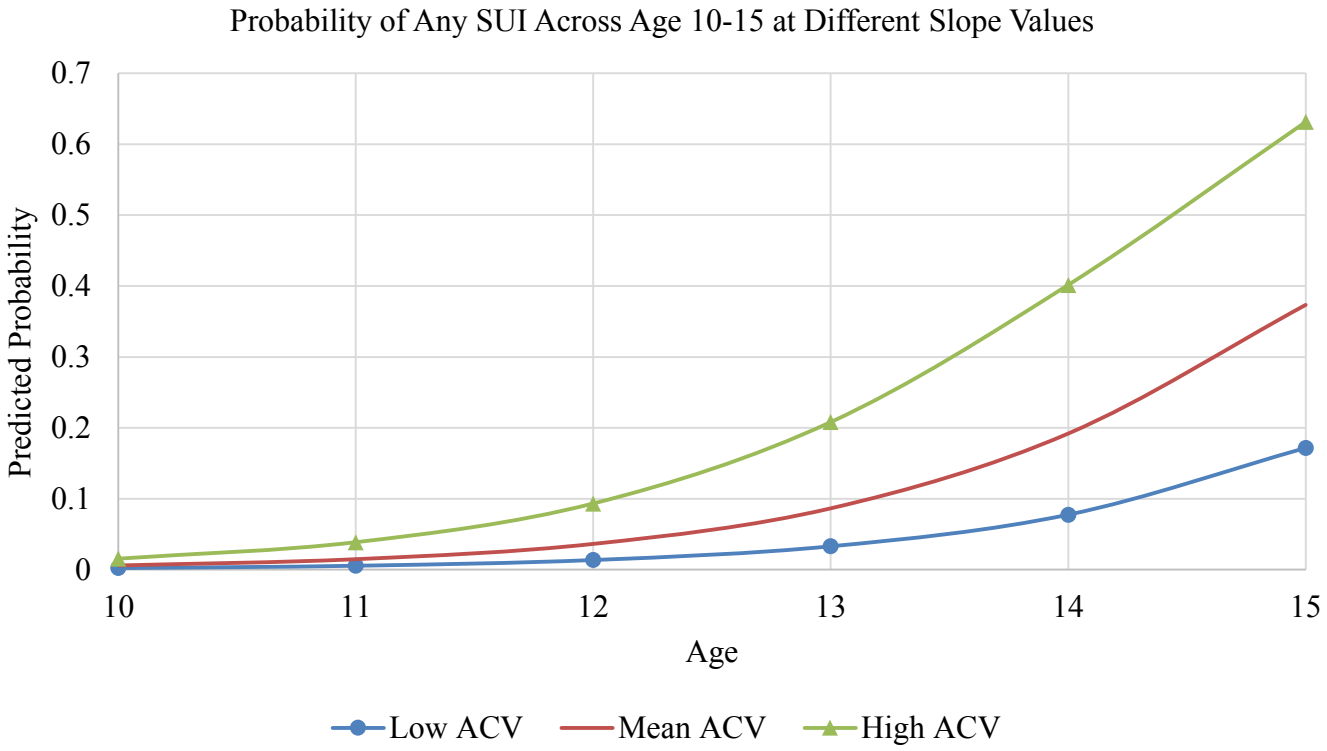


Figure 44. Plotting Predicted Probabilities from Parallel Process Growth Model for Spanish Use.

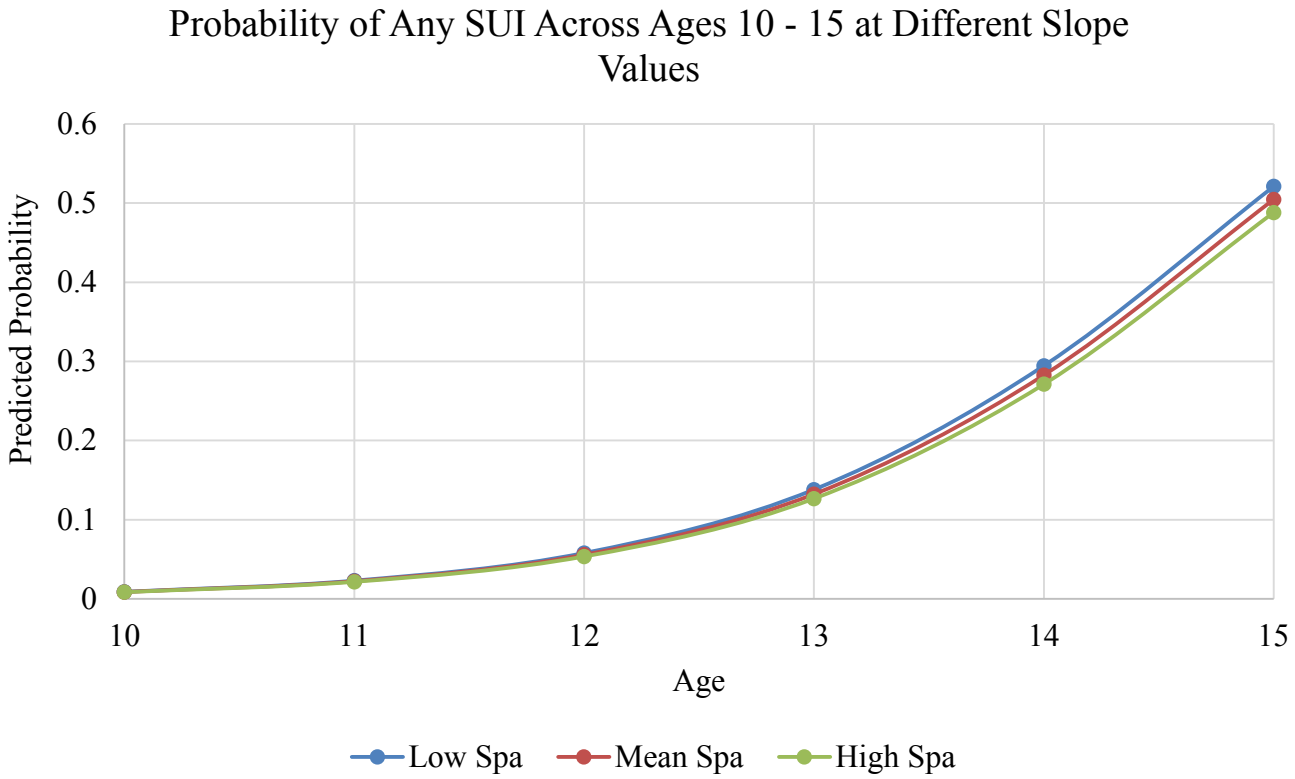


Figure 45. Plotting Predicted Probabilities from Parallel Process Growth Model for Mexican Cultural Values.

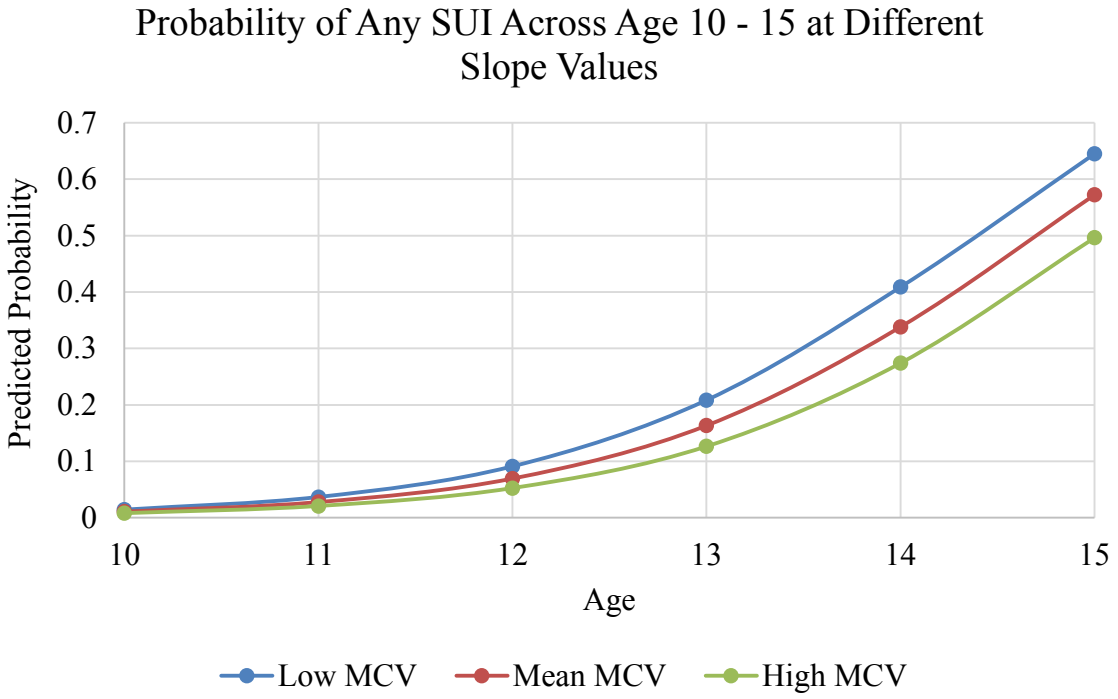


Figure 46. Plotting Predicted Probabilities from Parallel Process Growth Model for Traditional Family Values (FAMV).

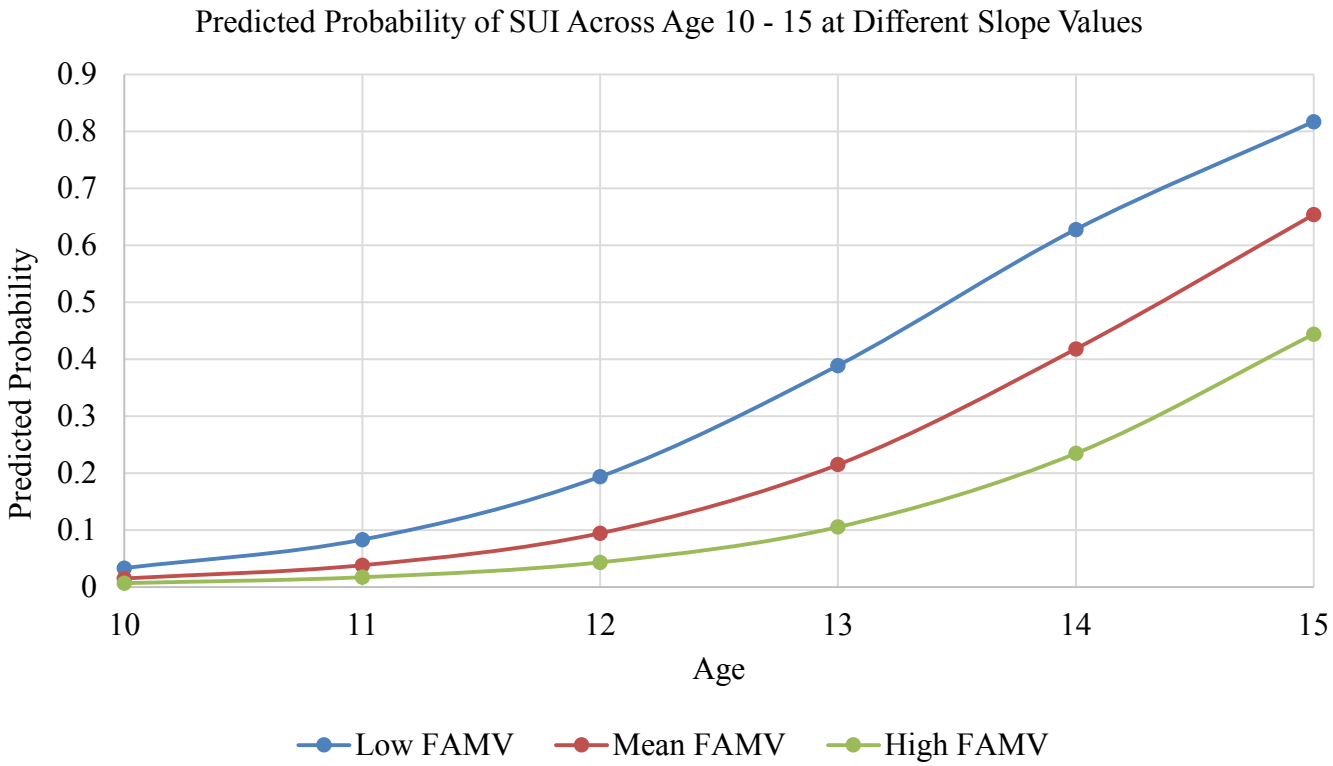


Figure 47. Plotting Predicted Probabilities from Parallel Process Growth Model for Mexican American Ethnic Pride.

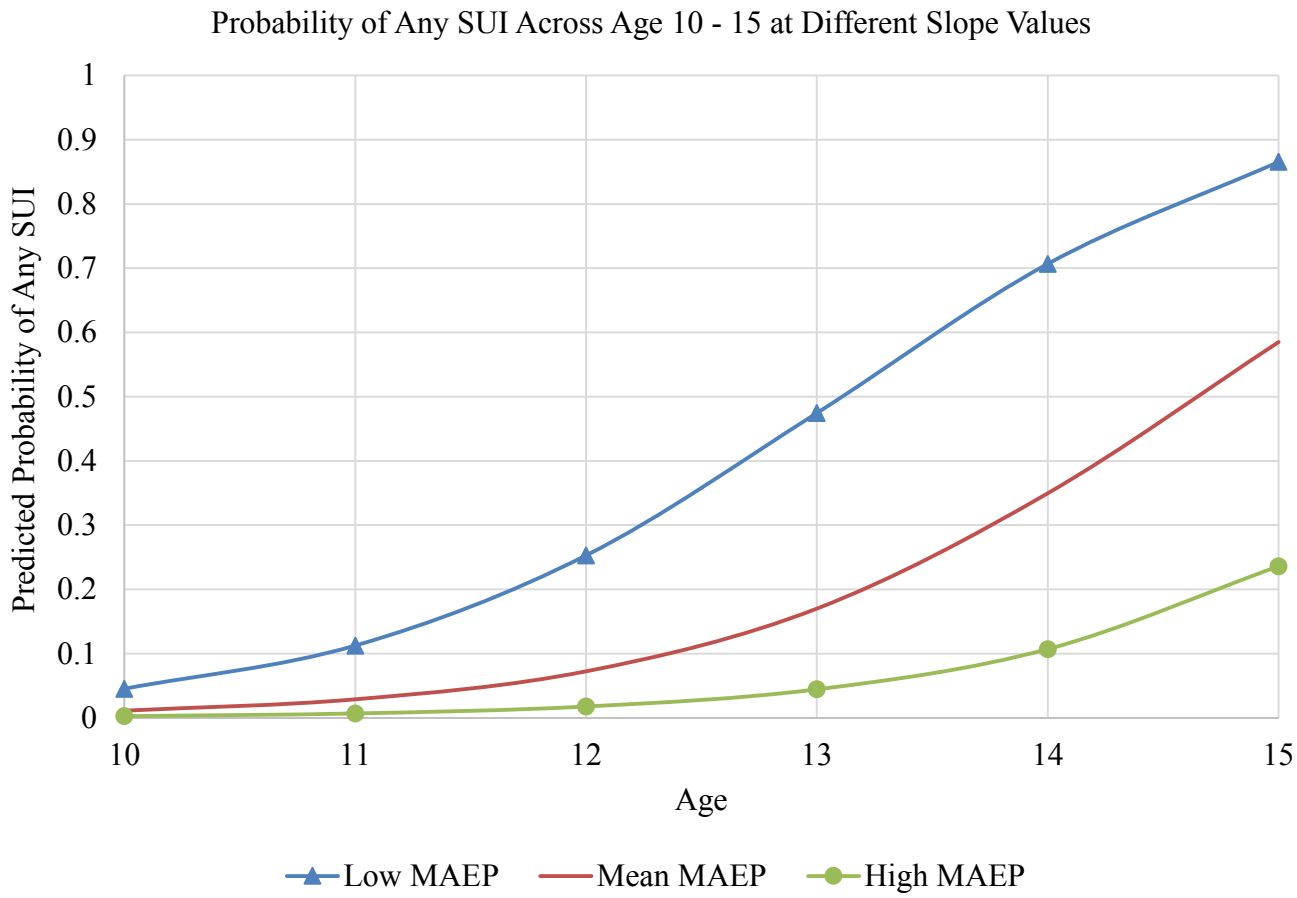


Figure 48. Alcohol Use Intensity Estimates- Zero Inflated Poisson

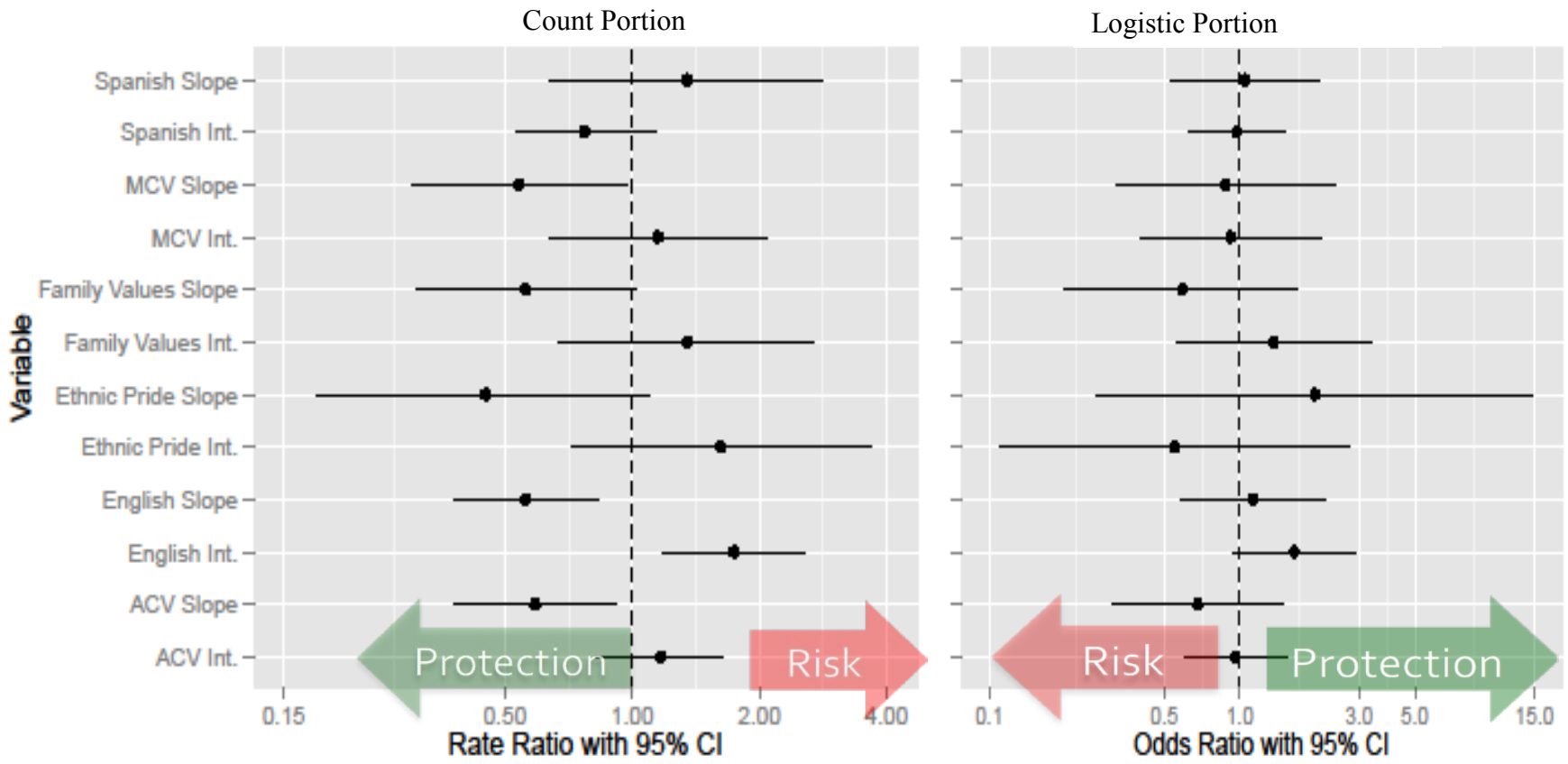


Figure 49. Plots of Predicted Count of Alcohol Use Intensity by Level and Change in Mexican Cultural Values

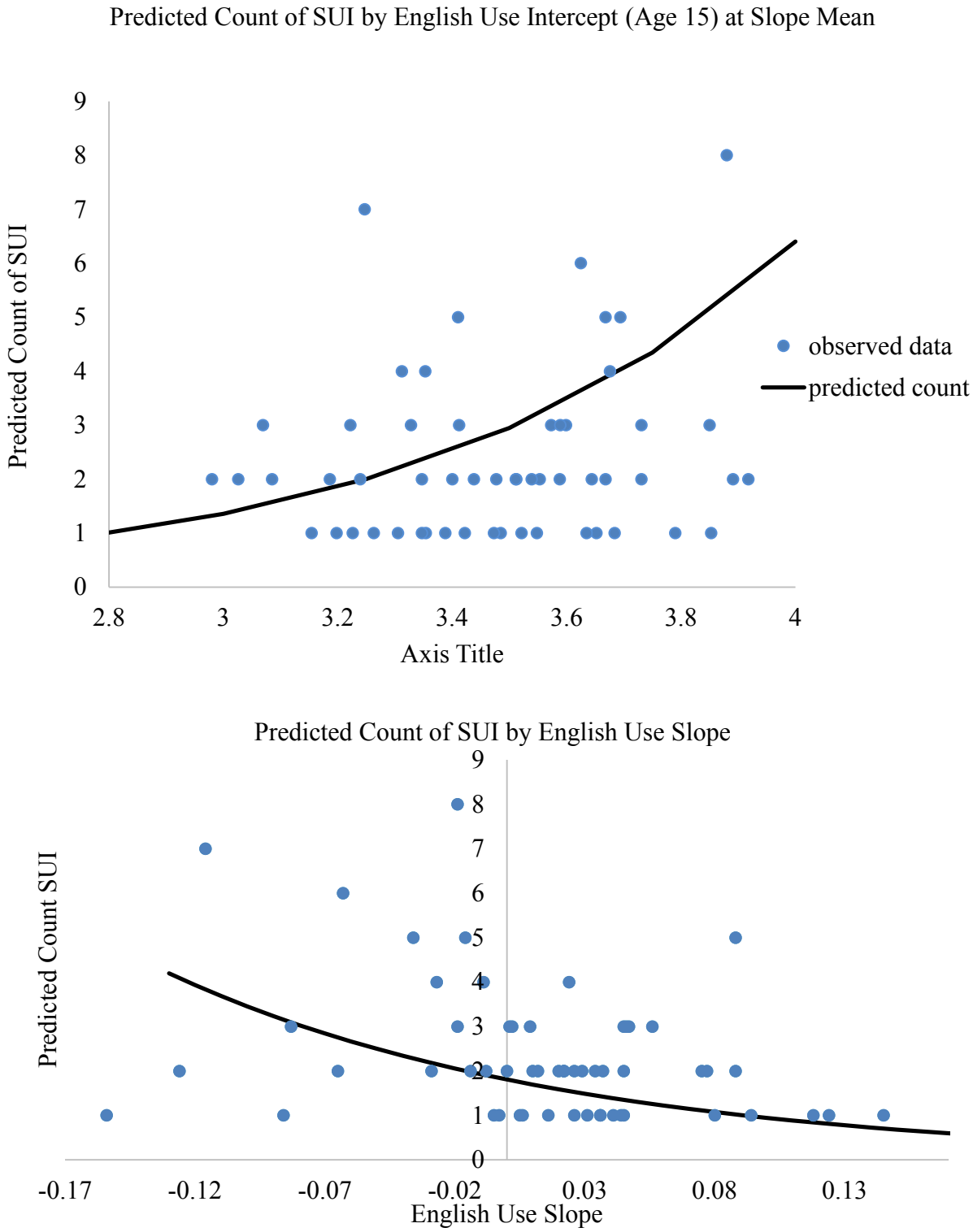


Figure 50. Predicted Count of Alcohol Use Intensity by Slope of American Cultural Values.

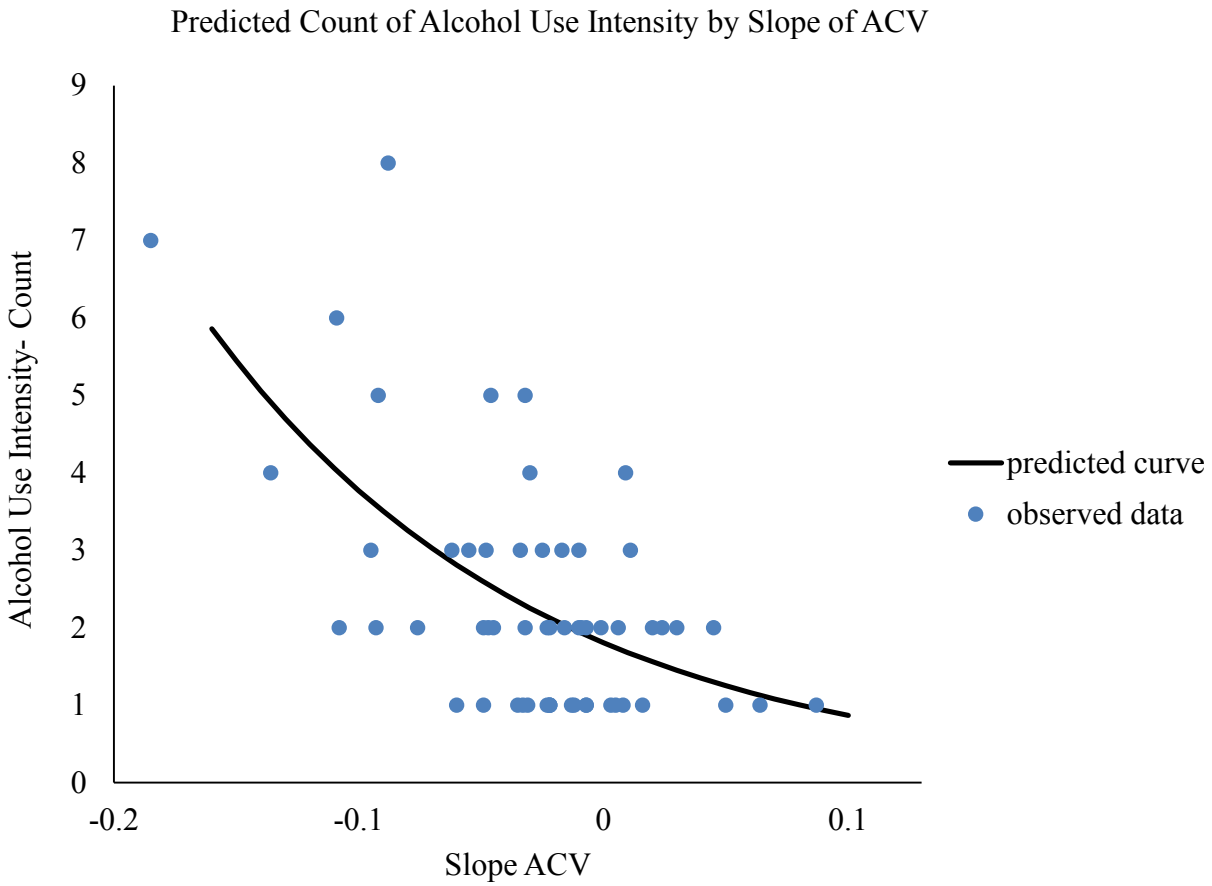


Figure 51. Plot of Predicted Count of Alcohol Use Intensity by Change in Mexican Cultural Values

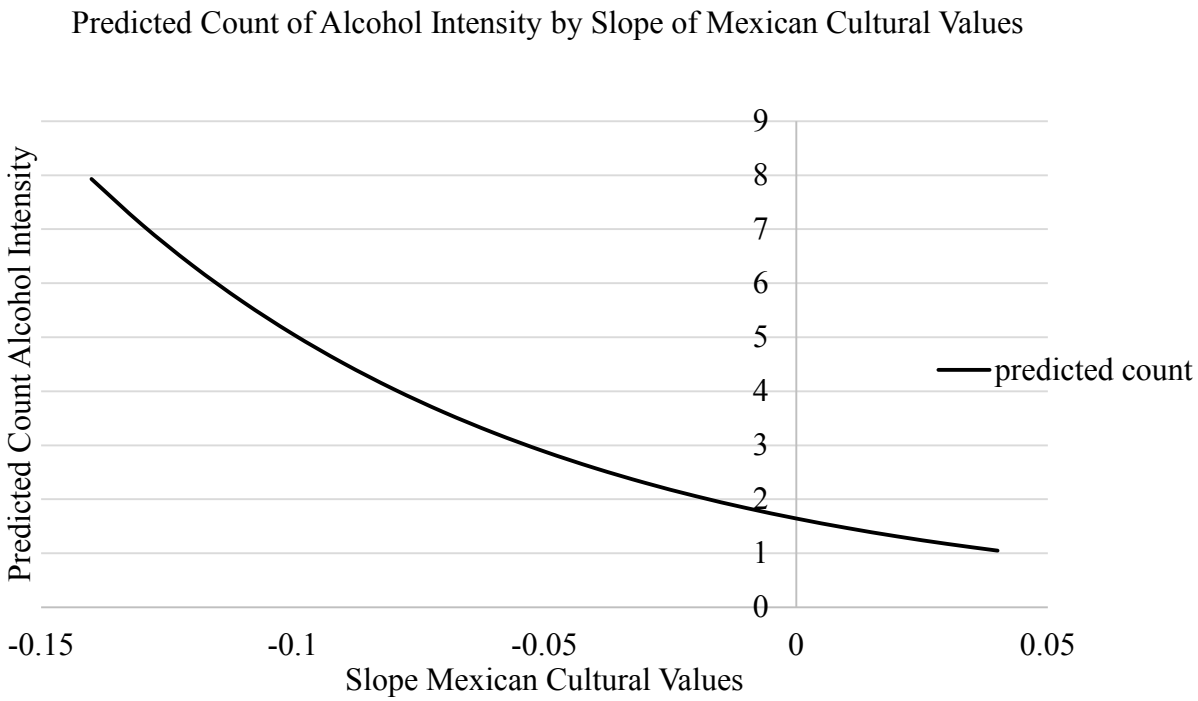


Figure 52. Plot of Predicted Count of Alcohol Use Intensity by Change in Ethnic Pride

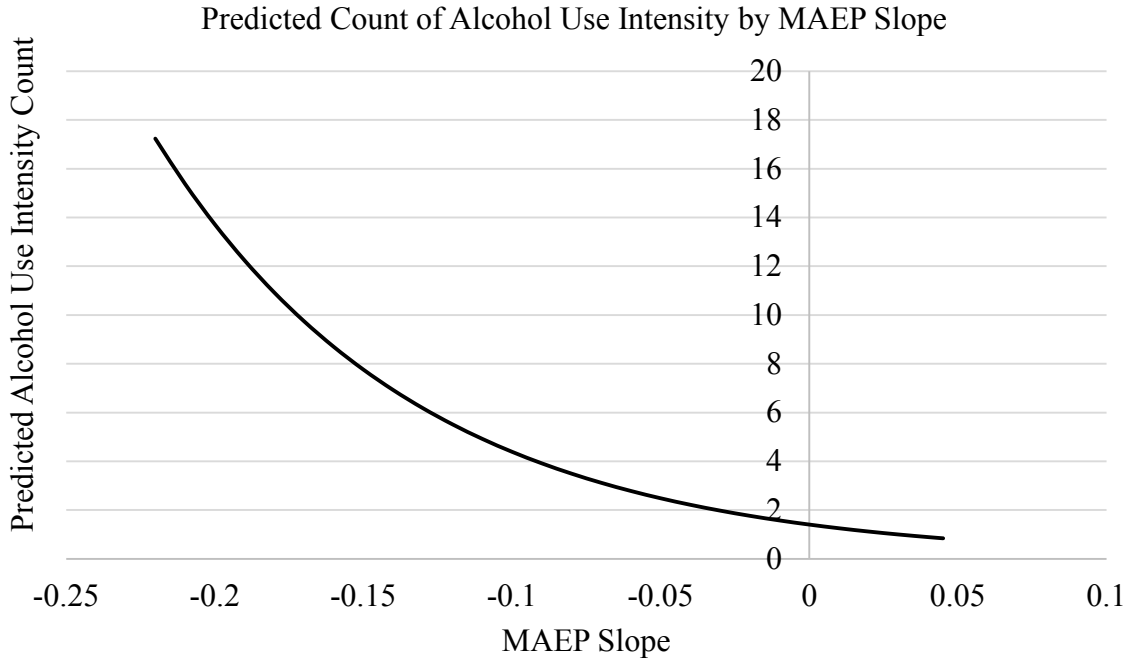


Figure 53. Forest Plot of Model Estimates Predicting Any Alcohol Use via Logistic Regression

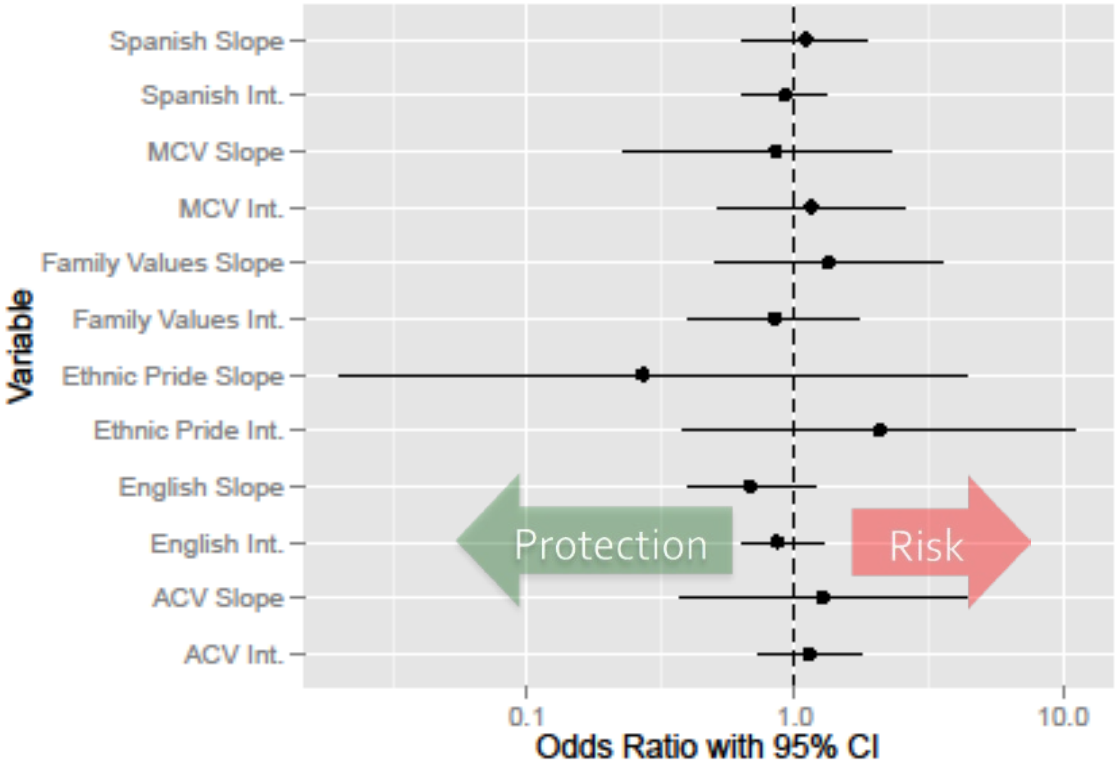


Figure 54. Forest Plot for Model Estimates Predicting Any Cannabis Use Via Logistic Regression