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Authors
Raymond-Flesch, Marissa
Browne, Erica N
Auerswald, Colette
et al.

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Family and School Connectedness Associated with Lower Depression among Latinx Early Adolescents in an Agricultural County

Marissa Raymond-Flesch, MD, MPH[a],
University of California San Francisco, Department of Pediatrics, Division of Adolescent and Young Adult Medicine

Erica N. Browne, MS[b],
RTI International, Women's Global Health Imperative

Colette Auerswald, MD, MS[c],
University of California, Berkeley, School of Public Health, Division of Community Health Sciences

Alexandra M. Minnis, PhD, MPH[b]
RTI International, Women's Global Health Imperative, And University of California, Berkeley School of Public Health

Abstract

Depression constitutes one of the greatest sources of morbidity and mortality for United States (U.S.) adolescents. Latinx are the fastest growing U.S. adolescent population, particularly in rural communities, and suffer from depression at higher rates than other racial/ethnic groups. Informed by community perspectives on adolescent health, we examined factors associated with depression among Latinx early adolescents in an agricultural community. We surveyed 599 predominantly Latinx 8th graders (12 to 15 years old) recruited from middle schools in Salinas, California. Depression was measured cross-sectionally with the Patient Health Questionnaire-8. Exposures included environmental, cultural, and family factors, assessed using validated measures. We used hierarchical logistic regression guided by Garcia Coll's Model for the Study of Developmental Competencies in Minority Children to examine associations between protective factors within each domain and depression. Eighty-six of the 599 youth (14%) scored above the clinical threshold for depression, with higher prevalence among females (19%) than males (10%), p=0.001. Environmental (school connectedness and neighborhood social cohesion) and family factors were associated with a lower odds of depression (all p 0.01). Increased language assimilation was associated with an increased odds of depression (p=0.007). Social cohesion in neighborhoods and family communication offered similarly strong protective associations with depression.

Corresponding author: Marissa Raymond-Flesch, MD, MPH, University of California San Francisco, 3333 California Street, Suite 245, San Francisco, CA 94118, Phone: 917-589-8930, Fax: 415-502-8930, Marissa.Raymond-Flesch@ucsf.edu.
[a.]University of California San Francisco, 3333 California Street, Suite 245, San Francisco, CA 94118
[b.]RTI International, 351 California Street, Suite 500, San Francisco, CA 94104
[c.]c/o UCB-UCSF Joint Medical Program, University of California Berkeley, School of Public Health, 570 University Hall, Berkeley, CA 94702

Keywords

depression; adolescent; Latinx; protective factors; schools; family

Introduction

The Latinx population is growing in all regions of the United States (U.S.), with Latinx youth projected to comprise almost one-third of US adolescents aged 10 to 19 years by 2050 (United States Department of Health and Human Services, 2016). Latinx youth experience more depressive symptoms and are at greater risk of attempting suicide than white or black youth (Kann et al., 2018). As among adolescents nationally, rates of depression in Latinx adolescents vary by sex with females experiencing higher rates than males (Scott, Wallander, & Cameron, 2015). Depression among Latinx youth may be further exacerbated by personal or family immigration status and barriers to care (Potochnik & Perreira, 2010; Raymond-Flesch, Siemons, Pourat, Jacobs, & Brindis, 2014). Rural and agricultural regions are among the fastest growing populations of Latinx and Latinx immigrants in the U.S. (Lichter, 2012), but little is known about the factors associated with risk of depression among youth in these communities and how they may differ from youth in large urban centers.

A Crecer: The Salinas Teen Health Study is a prospective cohort study designed to examine social and structural influences on the health and wellbeing of youth in Salinas, California, a small urban center in California's agricultural central coast. The study was initiated in collaboration with community co-investigators to investigate the intersection of community violence and reproductive health among adolescents; however, our formative interviews with community advisors, parent groups, and educators highlighted the community's concerns about adolescent mental health (Comfort, Raymond-Flesch, Auerswald, McGlone, Chavez, & Minnis, 2018) and stressors tied to community violence and other sources of structural disadvantage. Thus, this examination, motivated by community priorities for adolescent health needs, focuses on identifying promising directions for addressing mental health in early adolescence (Raymond-Flesch, Auerswald, McGlone, Comfort, & Minnis, 2017).

Model.

This analysis is guided by the Integrative Model for the Study of Developmental Competencies in Minority Children (Figure One) which postulates that the psychological development of minority children is a function of proximal (e.g., family) and distal (e.g., school, neighborhood) ecologies (Coll Garcia & Lamberty, 1996). According to this model each child begins with a particular social position defined by characteristics such as race/ethnicity, economic status and/or immigrant generation. Their social position is further influenced by promoting and inhibiting environments, such as schools and neighborhoods, as well as the effects of cultural adaptations, family, and individual factors that give rise to psychological development (Coll Garcia & Lamberty, 1996).

Social position.

Social position influences both proximal and distal factors within the Garcia Coll model. Parent education level is a measure of social position and proxy for socioeconomic status

that is well documented to impact a variety of health outcomes for minority youth, including mental health (Larson, Russ, Crall, & Halfon, 2008). As noted above, another measure of social position, racial and ethnic minority status, is associated with higher rates of depression for Latinx youth (Kann et al., 2018). Specific to immigrant communities, research on the effects of immigrant generation on adolescent mental health is limited. The "immigrant paradox" or the hypothesis that Latinx, particularly first-generation immigrants, have a protective advantage for some health outcomes, has been widely described in some adult health conditions (Fuentes-Afflick, Hessol, & Pérez-Stable, 1999; Markides & Coreil, 1986). However, studies on the impact of immigrant generation on adolescent depression show mixed results (Cervantes, Padilla, Napper, & Goldbach, 2013; Harker, 2001; Perreira et al., 2019). Some data suggest that first generation adolescent immigrants may experience high rates of depression, while those who have been in the U.S. longer or who receive adequate support from family and teachers are less likely to experience depression (Potochnick & Perreira, 2010). In keeping with Garcia Coll's description of social position as determined by race, social class, and ethnicity we incorporated immigrant generation as a facet of ethnicity.

Promoting and inhibiting environments: Neighborhoods.

Neighborhoods are environments outside of the home that Latinx youth navigate regularly and that have the potential to buffer the impact of social position on their wellbeing and reduce both internalizing and externalizing behaviors (White, Zeiders, & Safa, 2018). Supporting this, among urban Latinx adolescents higher rates of neighborhood belonging are associated with lower rates of depression (Maurizi, Ceballo, Epstein-Ngo, & Cortina, 2013; Donnelly et al., 2016; Vega, Ang, Rodriguez, & Finch, 2011). Higher levels of neighborhood social cohesion may protect Latinx adolescents by buffering youth from stressors that are associated with depression (Lee & Liechty, 2015; Lorenzo-Blanco et al., 2019; Nair, White, Roosa, & Zeiders, 2013). First generation immigrant youth may particularly benefit from living in more ethnically homogeneous neighborhoods (Roosa et al., 2009). Conversely higher levels of parent-reported neighborhood disorder as well as youth and parent reported neighborhood safety concerns are associated with higher levels of youth depressive symptoms (Behnke, Plunkett, Sands, & Bámaca-Colbert, 2011; Dawson et al., 2019). Importantly, none of these studies focused on the impact of neighborhood cohesion on Latinx adolescent mental health in rural or agricultural settings where neighborhood structure may markedly differ from urban settings, and few of these studies measure neighborhood cohesion from the youth's perspective.

Promoting and inhibiting environments: Schools.

School is the primary place outside of the home where adolescents spend time. The school and neighborhood environments can interact as a result of economic resources and social conditions such as community violence to reduce academic achievement, but positive school climate may promote academic achievement (Ruiz, McMahon, & Jason, 2018; Boxer, Drawve, & Caplan, 2020). The school environment also has a complex relationship with depression symptoms for Latinx adolescents. While some factors within the school environment, such as concerns for safety, have been associated with higher levels of depression symptoms among Latinx adolescents, support within schools has been associated

with lower depression symptoms for this group (Arora & Wheeler, 2018; Cupito, Stein, Gonzalez, & Supple, 2016; Scott et al., 2015; Maurizi, et al., 2013). Similarly, data from the National Longitudinal Study of Adolescent Health (Add Health) have demonstrated that higher school connectedness and perceptions of feeling cared for by teachers are associated with fewer depressive symptoms, though these associations are less protective for Latinx and Black youth than white youth (Joyce & Early, 2014). While the association between school connectedness and depression is well documented, no studies have focused on school connectedness and depression among rural Latinx adolescents.

Adaptive culture: Spirituality and church attendance.

In the wider literature religious beliefs and participation in religious activities are being examined with increasing frequency as potential protective factors for wellbeing and mental health (Koenig, 2009). Measures of religious engagement range from frequency of church attendance, to broader measures of spirituality, or the degree that spirituality-based beliefs influenced the respondent's life, sometimes referred to as religious salience ("Positive Indicators Project: Spirituality," 2018; Yonker, Schnabelrauch, & DeHaan, 2012). There is growing evidence that church attendance and even more so, spirituality, may reduce the risk of depressive symptoms in adolescents, though the effect appears weaker for minority adolescents than white adolescents in one recent meta-analysis (Scott et al., 2015; Yonker et al., 2012). Some studies suggest that religious engagement may moderate exposures to other risk factors for depression such as neighborhood socioeconomic disadvantage and community violence (Hull, Kilbourne, Reece, & Husaini, 2008; Scott et al., 2015). There remains a paucity of data about the relationship between spirituality or church attendance and depression for Latinx adolescents in rural communities.

Adaptive culture: Acculturation.

Garcia Coll and colleagues describe that adaptive cultural responses, "largely reflect culturally defined coping mechanisms to the demands placed by the promoting and inhibiting environments" (Coll Garcia & Lamberty, 1996). They note that these adaptive responses can include traditions and cultural legacies as well as the ways that groups adapt, including migration and acculturation. Acculturative stress is well documented to be associated with depression among Latinx adolescents (Perreira et al., 2019; Sirin, Ryce, Gupta, & Rogers-Sirin, 2013). The acculturation gap between parents and adolescents may further place youth at risk for depression (Nair, Roche, & White, 2018). Language assimilation is one long-standing measure of unidirectional acculturation which may be related to other factors influencing depression such as connectedness within community, school, and family (Stella, Huang, Schwalberg, Overpeck, & Kogan, 2003). We had particular interest in linguistic assimilation because youth in the formative phase of our work identified a lack of linguistic assimilation as a source of bullying and ostracism for new immigrants in the community. Here we use the Short Acculturation Scale for Hispanics (Marin, Sabogal, VanOss Marin, Otero-Sabogal, & Perez-Stable, 1987) to explore the relationship between linguistic assimilation and depression in rural adolescents.

Family.

The relationship between adolescent depression and family structure and function have been well studied for Latinx youth. Single parent families are associated with higher rates of depression for minority adolescents though this finding may be related to other factors such as childhood trauma associated with parental separation, economic constraints of a single-income household, or lack of adequate structural supports for single-parent families (Costello, Swendsen, Rose, & Dierker, 2008). Factors such as parental support, parental closeness, family cohesion (a component of familism), and family function, have been associated with lower depression symptom burden in single and dual parent households, though data are somewhat mixed (Arora & Wheeler, 2018; Costello, et al., 2008; Perreira et al., 2019; Scott et al., 2015). Parental support has been shown to decrease the risk of depressive symptoms for Latinx adolescents, even in the face of significant challenges such as migration (Potochnick & Perreira, 2010). Here we build on this work by exploring the association between depression and family structure through both traditional measures of family composition as well as factors more specific to families in rural communities such as parents working in agriculture or moving for work.

Multiple research questions guided our analysis, including: are school connectedness and neighborhood cohesion associated with lower risk of depression? Are adaptive cultural factors such as higher levels of spirituality, church attendance, or acculturation associated with lower risk of depression? Are family factors such as parental communication, monitoring, and presence in the home associated with lower risk of depression? Drawing from the Garcia Coll model contextualized in the literature above, we hypothesize that school connectedness, neighborhood cohesion, family function (communication, cohesion, parental monitoring), religion and spirituality will be associated with lower odds of depression while linguistic assimilation and female sex will be associated with higher odds of depression. We hypothesize that critical promoting environment factors, including school connectedness and neighborhood cohesion, will be associated with a lower odds of depression, independent of adaptive cultural and family factors. This analysis build on findings from our formative work (Raymond-Flesch, et al., 2017) to examine the relationships between social position (socioeconomic status and immigrant generation), promoting and inhibiting environments (neighborhoods and schools), adaptive cultural practices (spirituality, church attendance, and linguistic assimilation), family structure and function, and sex with depression in an understudied population of Latinx adolescents in a Californian agricultural community.

Methods

Study population and design.

This analysis includes baseline data from *A Crecer*. The primary goal of *A Crecer* is to identify protective factors that promote positive youth development as well as factors that heighten youth's risk for violence and adverse sexual health outcomes during the transition from early to middle adolescence. The study cohort includes primarily Latinx youth recruited from all four of the public middle schools in Salinas, California. Between November 2015 and March 2017, our team enrolled 599 youth (approximately

150 per school), representing about one-third of the total eighth grade population of approximately 1,800 youth in the school district. Bilingual research assistants recruited participants using strategies developed in partnership with leadership at each school, with the study's Community Advisory Board, and through our formative research (Comfort et al., 2018). These included approaching youth during lunchtime and through afterschool programs, classroom presentations, and presenting during school assemblies and meetings of established parent groups ("Cafecitos"). Eligible youth were in 8th grade, between 12 and 15 years old, spoke English or Spanish, and intended to live in Salinas for at least one year after enrollment. In accordance with A Crecer's community-engaged approach and in partnership with community advisors in the Salinas Unified School District and Health Department, the study included youth of all racial and ethnic backgrounds to provide useful and representative data to our community partners. Questionnaires were interviewer-administered with data collected via computers, with sensitive topics assessed using audio computer-assisted self-interviewing. The study team obtained parent permission by telephone using a structured protocol. Adolescents provided written assent at the time of their baseline study visit. The Institutional Review Board at RTI approved the study procedures and consent documents (parent permission and youth assent). Participants received a $20 payment for the visit.

Study setting.

The Salinas Valley is at the heart of California's agricultural central coast. The agricultural sector is the largest employer in the county. The city of Salinas is 77% Latinx (Deloitte and MIT, 2019). Migrants and immigrants make up 38% of the local population and 17% of the population lives below the federal poverty line ("Data USA: Salinas, CA," 2019).

Measures.

Factors of child development hypothesized to be associated with depression were adapted from the Integrative Model for Developmental Competencies in Minority Children (Coll Garcia & Lamberty, 1996; Marks & Garcia Coll, 2018) (Figure 1).

Outcome.

Depression was measured using the validated Patient Health Questionnaire-8 (PHQ-8) (Kroenke et al., 2009) with a score of 10 validated as correlated with the diagnosis of depression in national samples and Latinx populations (Alpizar, Plunkett, & Whaling, 2018; Kroenke et al., 2009). Established translations are available in English and Spanish. In addition, this brief 8-item version was selected to minimize participant burden, a particularly important consideration for this study's young cohort. (Cronbach alpha, $\alpha=0.78$).

Promoting and inhibiting environments: School connectedness and neighborhood cohesion.

We measured school connectedness using the 5-item scale from the National Longitudinal Study of Adolescent to Adult Health as well as 3-items to expand on the assessment of relationships with teachers (Bond et al., 2007; Resnick et al., 1997). The school connectedness score was created by taking the mean of the eight items ($\alpha=0.79$).

Neighborhood social cohesion was based on a 5-item subscale of a collective efficacy measure (Sampson, Raudenbush, & Earls, 1997) in which participants indicated agreement with each statement on a 4-point Likert scale. A composite score was created from the average of the five items (α=0.76). For both measures, higher scores indicate greater connectedness or cohesion.

Adaptive culture: Spirituality, church attendance, and language acculturation.

Religiosity consisted of two measures: frequency of religious service attendance in the past six months and spirituality. Attendance at church or other religious service was categorized as "never or rarely," "about 1-2 times per month," and "about once a week or more." The 7-item Spirituality Scale for Adolescents ("Positive Indicators Project: Spirituality," 2018) assessed to what degree spirituality-based beliefs influenced the respondent's life on a 5-point Likert scale that ranged from 1 ("not at all") to 5 ("completely"). The spirituality score was created by taking the mean of seven items (α=0.90).

The language acculturation measure was adapted from the Short Acculturation Scale for Hispanics (Marin, Sabogal, VanOss Marin, Otero-Sabogal, & Perez-Stable, 1987). The scale included 10-items, and responses were given on a 5-point bipolar scale from 1 ("only Spanish") to 5 ("only English"), with 3 meaning "both equally." Example questions included "what language(s) do you usually speak in your home?" and "in what language(s) do you think?" A composite score was created from the mean of the ten items (α=0.88), with a higher score indicating higher level of linguistic acculturation.

Family: Structure and support.

Family exposures included measures of both family structure and support from family members. Family structure included whether the participant lived with his/her mother or father (at least part-time), had a parent who worked in agriculture, and, in order assess parental migration for labor, we asked "Does your mother/father have to move during part of the year because of her/his job?" Crowded housing conditions were based on the US Census Bureau definition of more than one person per room in the home (Blake, Kellerson, & Simic, 2007). Family support was assessed using four measures: parental monitoring, maternal and paternal communication (assessed individually), and family cohesion. Parental monitoring was measured by three questions that asked youth to indicate how often parents "make sure they know who you are spending your time with," "try to get to know who your friends are," "make sure they know where you are when you are not in school" (Cottrell et al., 2007; Gorman-Smith, Henry, & Tolan, 2004). Response options ranged from 1 ("almost never") to 4 ("almost always"). The parental monitoring score was created from the mean of these items (α=0.67). For the other three measures, participants indicated agreement with each item on a scale of 1 ("strongly disagree") to 4 ("strongly agree"). Parent-adolescent communication was measured separately for fathers and mothers using 10-items that assess communication ease, parental attentiveness and satisfaction (Miller, Forehand, & Kotchick, 2000). Each score was created from the mean of the 10 items (α=0.84 and α=0.85, respectively). Family cohesion was measured using 6-items that assess emotional closeness, dependability and support (Tolan, Gorman-Smith, Huesmann, & Zelli,

1997). The score was created from the mean of six items (α=0.79). Higher scores on all three measures represent greater monitoring, stronger communication, and greater cohesion.

Child characteristics.

Participant's age and sex were characteristics included in the conceptual model, for their known relationship with child development. Sex was determined by asking participants "What is your sex?"

Social position: Socioeconomic status, race/ethnicity, and immigrant generation.

The following sociodemographic characteristics described the study sample: maternal education level, government assistance in the past 6 months, food insecurity, ethnicity, immigrant generation, and years lived in the US. Immigrant generation was based on participants' self-reported country of birth and his/her parents' country of birth and categorized as 1st (participant not born in US), 2nd (participant born in US and at least one parent born outside US), or 3rd + (participant and both parents born in US). Likewise, ethnicity was based on self-identification and the participant's parents' and grandparents' reported country of birth. Food insecurity was assessed for the past six months (*Spanish-Language Current Population Survey Food Security Supplement*, 2013).

Statistical analysis.

All measures were summarized using means and standard deviations (for continuous variables) or counts and percentages (for categorical variables). Cronbach alpha's were calculated for each scale measure to assess its internal consistency and reliability. If a participant was missing a response to one of the scale items, the response was imputed using the average response of the other scale items. For each of the scale measures, there were fewer than 5 participants (<1%) with missing data. Participants who did not have contact with their father did not have a paternal communication score and were therefore not included in analyses with that measure; same for those without contact with their mother. We conducted preliminary analyses to explore the association between each measure of the conceptual model and depression using chi-square tests (categorical) or t-tests (continuous). We also explored correlations among measures of the conceptual model using Spearman rank correlation. Each measure was included in individual logistic regression models, adjusting for age and sex and controlling for recruitment school to account for the clustered structure of the data. Hierarchical logistic regression was then used to build successive regression models that examined associations between factors comprising each domain of the conceptual model and depression. Only variables with a p-value< 0.05 in the bivariable analyses were included in the final modelling (except for biological measures of age and sex which were included in all models). Factors were assessed by increasing proximity to the outcome, added as blocks based on domains in the Garcia Coll framework. Model 1 included promoting and inhibiting environments measures, then adaptive culture variables were added (model 2), and finally family measures (model 3). The Bonferroni correction was used to adjust for multiple tests, and a p-value < 0.003 was considered statistically significant. All analyses were performed using Stata 15.0 (StataCorp LP, College Station, Texas).

Results

The characteristics of the study sample (n=599) are described in Table 1. About half (53%) were female, most were aged 13 years (70%), and nearly all (94%) identified as Latinx. The majority were born in the United States (87%), primarily in Salinas, California (74%). Slightly more than half (53%) received government assistance in the past 6 months. Forty-two percent had a mother with less than high school education.

Depression: Primary developmental outcome.

Eighty-six of the 599 youth (14%; 95% confidence interval [CI]: 12%, 17%) scored above the threshold for depression, with two (<1%) scoring above the threshold for severe major depression. Depression was higher among females than males (19% vs. 10%, p=0.002). There was no statistically significant association with age. Spearman correlations for all exposures in the Garcia Coll model can be found in Table 2.

Environment.

The average school connectedness and neighborhood cohesion scores for those with and without depression are presented in Figure 2. On a scale of 1 to 4, with 4 meaning high connectedness or cohesion, those with depression had a lower average school connectedness score (3.3) and neighborhood cohesion score (2.8) compared to those without depression (mean scores 3.5 and 3.1, respectively). Indeed, higher school connectedness and neighborhood cohesion were associated with lower odds of depression (all p<0.001, Table 4). For each one-point increase in the school connectedness mean score, the odds of depression decreased 85% (95% CI: 71%, 92%). The odds of depression were 0.41 times lower for each one-point increase in neighborhood cohesion mean score (95% CI: 0.26, 0.65; p<0.001).

Adaptive culture.

The mean language acculturation score was 3.6, and the mean score was modestly higher among those with depression (Figure 2). Similarly, there was a trend in increased odds of depression with increased language acculturation scores (adjusted odds ratio 1.46, 95% CI: 1.06, 2.01), but this did not reach the level of statistical significance adjusted for multiple comparisons. Most youth (60%) reported attending religious services, either 1-2 times per month (26%) or at least once a week (34%), see Table 3. Regular religious service attendance was less common among youth who were depressed (52% of youth with depression never or rarely attended compared with 38% of those without depression, p=0.04). Spirituality mean scores were modestly higher among those without depression (3.6 versus 3.3, Figure 2), and having a higher spirituality-based belief mean score was associated with lower odds of depression (Adjusted odds ratio [AOR] 0.67, 95% CI: 0.52, 0.85, p=0.001; Table 4).

Family.

Nearly all participants (97%) lived with their mother at least part-time (Table 3). Three-quarters (76%) lived with their father at least part of the time, and 91% had contact currently. About half (49%) had at least one parent working in agriculture. There were no

statistically significant associations between any family structure measures and depression (Table 4). As depicted in Figure 2, the mean scores for each family support factor (range 1 to 4) were higher for those without depression than for those youth who screened positive for depression. Likewise, the odds of depression were lower among participants with greater parental monitoring, stronger parent communication, and higher family cohesion (Table 4, all p<0.003). As evidenced by both the mean differences presented in Figure 2 and the adjusted odds ratios (Table 4), maternal communication appeared to exert the greatest protective association with depression among the family support measures evaluated (AOR 0.30, 95% CI: 0.19, 0.48, p<0.001).

Hierarchical regression.

Table 5 also presents the adjusted odds ratios from the multiple hierarchical logistic regression models. More distal measures such as school connectedness had a strong association with decreased odds of depression. There were also trends in associations across measures within each model domain, with neighborhood cohesion, language assimilation, and maternal communication associated with depression, although at a p 0.01. Maternal communication was moderately correlated with school connectedness (Spearman's rho 0.38, p<0.001) and parental monitoring (Spearman's rho 0.29, p<0.001) and strongly correlated with family cohesion (Spearman's rho 0.56, p<0.001) (Table 2).

Discussion

This study adds to the limited literature about depression in the US's growing population of rural Latinx youth. Guided by Garcia Coll's model we assessed the contributions of environmental, cultural, and family factors to depression. In this large sample of predominantly Latinx youth from an agricultural community, 14% scored positive for depression, higher than national data for U.S. adolescents aged 13-14 (Merikangas et al., 2010). Distal environmental factors including school connectedness and neighborhood cohesion, as well as more proximal factors such as language assimilation and parental communication, were all associated with lower odds of depression in this understudied community

Promoting and inhibiting environments.

Environmental measures were associated with depression in all analyses. As anticipated, our findings indicate that school connectedness may be a particularly powerful protective factor for rural Latinx youth. This aligns with findings on the protective effects of school connectedness among urban Latinx youth (Arora & Wheeler, 2018; Cupito et al., 2016; Scott et al., 2015). These benefits extend from education to mental health. Latinx teens who are well connected in school are more likely to disclose suicidal ideation to an adult and seek adult help (De Luca & Wyman, 2012). Education literature suggests that collectivist cultural norms make school connectedness more critical for Latinx youth than their white peers (Espinoza & Juvonen, 2011). Latinx youth may particularly benefit from mentoring relationships with teachers, a finding that was also supported by our formative focus groups in the community (Raymond-Flesch, et al., 2017), and that has been shown to be of heightened benefit for Latinx youth relative to other racial or ethnic groups (Crosnoe,

Johnson, & Elder Jr, 2004),. This suggests that future research could focus on developing and testing school-based interventions that promote adult mentoring and connection to peers to reduce the burden and sequela of depression among Latinx youth in immigrant, agriculture-based settings.

Higher neighborhood cohesion was also associated with lower odds of depression in our sample as we expected. This aligns with research showing that neighborhood cohesion is associated with lower rates of depression in urban Latinx populations (Donnelly et al., 2016; Vega et al., 2011). However, the structure and make up of neighborhoods in agricultural communities are markedly different from urban settings. The California Department of Housing (2020) notes that agricultural communities are characterized by high rates of poverty, extremely high levels overcrowding, and disproportionately poor housing conditions. The proportion of farmworkers living doubled-up with families has been increasing since 1990, giving rise to more children who are growing up in these adverse conditions (California Department of Housing & Community, 2020). It is possible that extended family networks and strong social ties in immigrant enclaves, which have been described in urban settings, are among the factors contributing to protective impacts of neighborhood cohesion (Cardoso & Thompson, 2010; Lee & Liechty, 2015; Roosa et al., 2009). Future research could further explore this hypothesis in rural settings.

Adaptive Culture.

Culture, in the form of religious activities and language use, influenced the odds of depression in our study. As expected and consistent with prior research, our analyses show that greater church participation and spirituality conferred some protection from depression, despite these factors not retaining statistical significance when adjusting for other factors across the model domains. Prior studies suggest that religious engagement may reduce depression among young Latinx (Fernandez & Loukas, 2014) but results vary (Lerman et al., 2018). In other immigrant populations church attendance can function as a form of social connection to adult role models and peers, both of which may be protective (Kang & Romo, 2011). For Latinx youth, it is possible that church attendance may particularly reinforce a collectivist culture, including reinforcing family ties through shared activity, but data on this remain sparse. In addition to facilitating external connections, church attendance may also increase spirituality, an internal resource which may improve psychological wellbeing among minority adolescents (Davis & Kiang, 2016; Kang & Romo, 2011). In our study spirituality was associated with lower odds of depression regardless of church attendance, suggesting that both church attendance and interventions that cultivate spirituality could be protective for Latinx youth.

As another measure of adaptive culture, participants with greater language assimilation trended towards having increased odds of depression. The relationship between language assimilation and depression is less clear. It is possible that the impact of language assimilation was not greater in our study due to the relatively small proportion of first-generation immigrants. Additionally, language assimilation may be a proxy for youth who are experiencing an acculturation gap, or the stress that arises due to different acculturation levels and cultural expectations between first generation immigrant parents and their second-

generation children (Cervantes et al., 2013). For example, there is some data to suggest that immigrant children who speak a language other than English at home are more likely to feel unsupported by their parents or bullied at school (Stella et al., 2003). In this study our measure of acculturation was limited as it is unidimensionally focused on assimilation and does not capture other possible acculturation trajectories such as separation (rejection of the dominant culture) and biculturalism (Schwartz, Unger, Zamboanga, & Szapocznik, 2010). Research with these more nuanced measures of acculturation are likely to reveal a more complex relationship between acculturation and depression. Additionally, we lacked acculturation stress and acculturation gap measures to capture these phenomena in our sample. Acculturation stress is well demonstrated to be associated with depression in Latinx youth (Perreira et al., 2019; Sirin et al., 2013). Importantly, given US immigration patterns, acculturative stress is relatively rare among white youth which may contribute to the persistent disparity in depression rates between Latinx and White adolescents. Additional research on the Acculturation Gap and its relationship to adolescent individuation across different Latinx populations is needed to further understand the impact of these adaptive cultural factors on the mental health of Latinx adolescents.

Family.

As expected, in our study, adolescents with higher scores for each family support factor had lower odds of depression. Maternal communication appeared to contribute the greatest protective association. This finding is consistent with prior literature and supports our formative focus groups which identified the important role that parents play in Latinx adolescent development, as well as the promotion of educational engagement and healthful behaviors (Potochnick & Perreira, 2010; Scott et al., 2015; Raymond-Flesch et al., 2017). These results confirm that parents play a critical role in adolescent mental health and that protective interventions at the family or environmental level could enlist parental engagement in intervention development and implementation.

Overall our findings that connections with parents, schools, and neighborhoods have the potential to protect rural Latinx adolescents from depression are critical at this juncture as Latinx youth in immigrant communities are particularly vulnerable to immigration policy that aims to disrupt their ties to the family members, neighborhoods, and school through deportation and family separation. Nationally, 27% of youth are born to immigrant parents (Immigrant Children, 2018). The proportion of immigrants in agricultural communities like Salinas is even higher ("Data USA: Salinas, CA," 2019). Recent policy changes to deportation priorities have broadened the scope of deportation efforts, increasing the potential to separate this large group of youth from their parents extended family members who support them (Artigiga & Ubri, 2017; Kelly, 2017). Children who do experience parental deportation or detention are well documented to be at risk for significant mental health morbidity including depression and post-traumatic stress disorder (Gulbas et al., 2016; Rojas-Flores, Clements, Hwang Koo, & London, 2017). Given the potential for family separation due to migration for work or deportation in communities like Salinas, it will be important to understand more about how to support youth who are experiencing or at risk for family separation due to forced migration or deportation. This analysis points to the

supportive potential of neighborhoods and schools, highlighting opportunities to strengthen mental health outcomes through multiple avenues.

While our study adds to the limited literature about depression among Latinx youth in agricultural communities, there are several limitations. Our measure of depression, the PHQ-8, is a self-reported measure that asks participants to consider their depressive symptoms for the past two weeks and may underestimate prevalence of depression in this sample compared to other data sources, such as the National Survey on Drug Use and Health, which measures depression over the past year. Our data are cross sectional hence we could not assess causal relationships or test model pathways or mediators because of the inherent temporality limitations. Likewise, we could not assess the impact of the dynamic changes of adolescent development and acculturation over time. However, our conceptual model that guided analysis allowed for consideration of domains that reflected multi-level influences on depression. Future longitudinal examinations could extend this work by identifying the most influential domains and pathways through which they operate to affect mental health. Our sample is from a single geographic area and predominantly Mexican American, limiting generalizability. However, our sample's ethnic profile is similar to other established migration destinations for agricultural work in California and other regions that receive predominantly Mexican migration flows and relevant to the rapidly growing populations of Latinx in rural communities around the country (Lichter, 2012), populations whose perceived access to health care and mental health has been shown to be affected by the current U.S. immigration policy environment (Callaghan et al., 2019; Eskenazi et al., 2019).

To address disparities in rates of depression for Latinx adolescents it is necessary to understand what factors are associated with lower levels of depression, particularly in understudied immigrant agricultural communities where Latinx populations are rapidly growing. This study suggests that it will be critical to continue to investigate how connections with neighborhood, school, and family can be strengthened to reduce the burden of depression for Latinx youth in agricultural communities, particularly given the potential disruption of these connections related to deportation of youth or their parents with shifting public and immigration policy environments. Our findings underscore the need to preserve youths' safe and stable connections to family members and schools in order to preserve their health and wellbeing.

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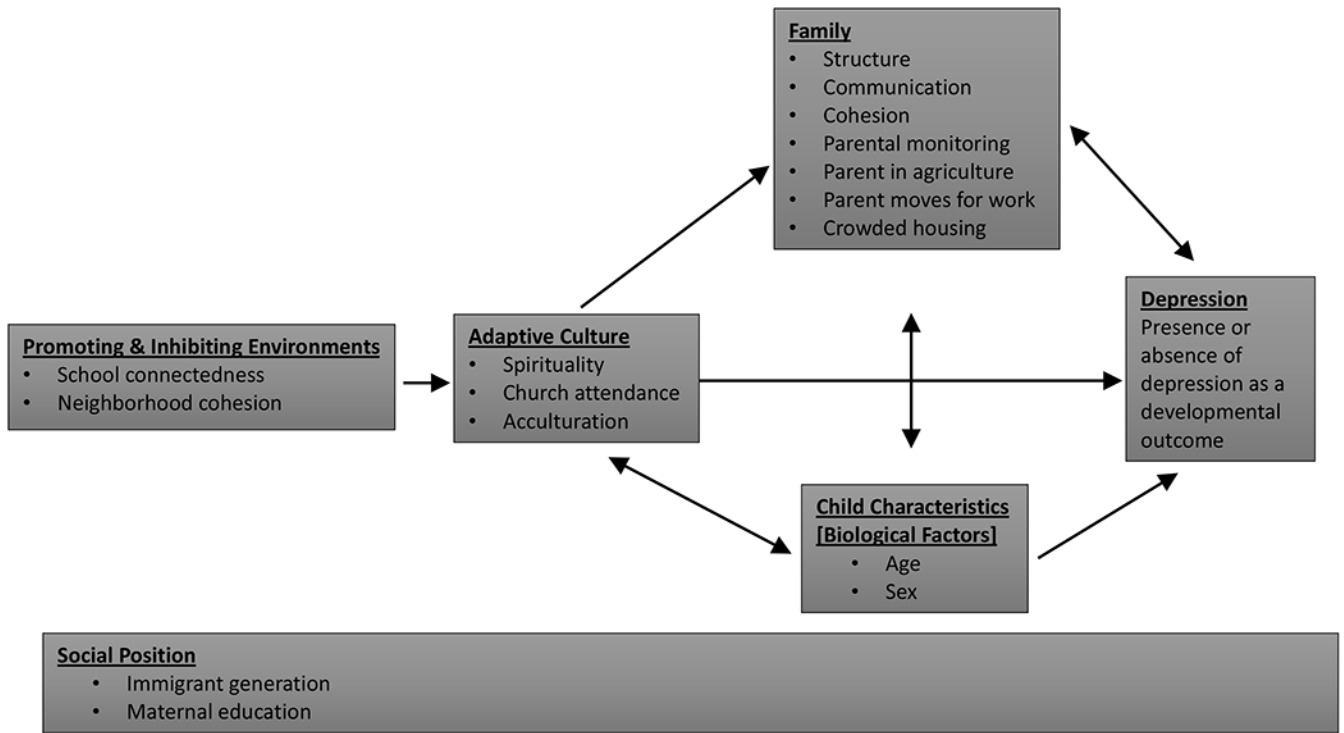
Figure 1.
Factors influencing the Development of Depression, an Adapted Model of Developmental Competencies in Minority Children. Adapted from Garcia Coll, et al 1996. Bulleted factors are the measures specific to the *A Crecer* study chosen to represent each construct.
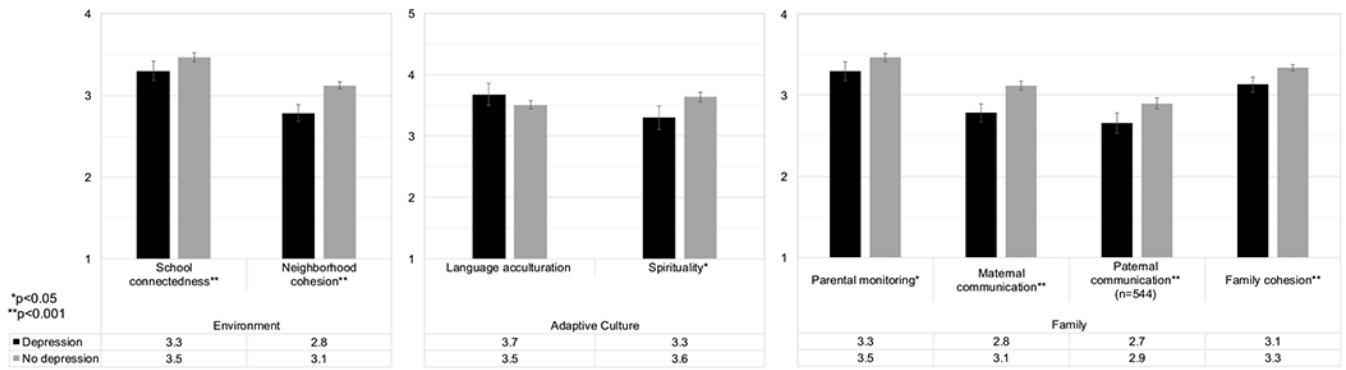
Figure 2.
The mean, with 95% confidence interval, of child development factors by adolescents with and without current depression (N=599). Depression was assessed by PHQ-8 (score 10); 1=low score. Mean differences tested using t-tests.

Table 1.

Characteristics of adolescents in 8th grade enrolled in *A Crecer*: The Salinas Teen Health Study, 2015-2017.

	Total	
	N	**%**
Sociodemographic characteristics	**599**	**(100)**
Mean age, years (SD)	13.2	(1)
Female	316	(53)
Immigrant generation		
1st: born outside of the US	71	(12)
2nd: US born/immigrant parents	422	(70)
3rd+: US born and parents US born	97	(16)
US born; generation unknown	9	(2)
Latinx[a]	566	(94)
Mexican origin	531	(89)
Central American origin	64	(11)
Unknown origin	20	(3)
Years lived in US		
Entire life	525	(88)
More than 5 years	55	(9)
5 years or less	19	(3)
Mother's education		
Less than high school	255	(42)
High school/GED	177	(30)
More than high school	149	(25)
(Unknown)	18	(3)
Received government assistance[b] past 6 months	320	(53)
At least one parent works in agriculture	292	(49)
Food insecurity (hunger)	46	(8)

GED= general equivalency diploma; SD= standard deviation; US = United States

[a] Percentages add to >100% as participants may have more than one origin

[b] Includes Medi-Cal, unemployment benefits, food stamps

Table 2.

Spearman correlations between child development factors.

	School connectedness	Neighborhood cohesion	Language acculturation	Church attendance	Spirituality	Parental monitoring	Maternal communication	Family cohesion	Paternal communication
School connectedness	1.00								
Neighborhood cohesion	0.26	1.00							
Language acculturation	−0.04	0.07	1.00						
Church attendance	0.16	0.12	−0.15	1.00					
Spirituality	0.32	0.14	−0.03	0.35	1.00				
Parental monitoring	0.18	0.10	−0.04	0.13	0.19	1.00			
Maternal communication	0.38	0.21	0.00[b]	0.14	0.30	0.29	1.00		
Family cohesion	0.38	0.24	−0.06	0.18	0.40	0.31	0.57	1.00	
Paternal communication [a]	0.31	0.23	0.08	0.10	0.25	0.13	0.43	0.44	1.00

[a] n=539

[b] exact estimate: −0.0008

Table 3.

Distribution of factors of child development by current depression in adolescents enrolled in *A Crecer*: The Salinas Teen Health Study, 2015-2017.

	Depression[a]					
	Yes		No		Total	
	N	(%)	N	(%)	N	(%)
	86	**(100)**	**513**	**(100)**	**599**	**(100)**
Adaptive Culture						
Church attendance						
Never/rarely	45	(52)	197	(38)	242	(40)
About 1-2 times/month	17	(20)	139	(27)	156	(26)
About once a week or more	24	(28)	177	(35)	201	(34)
Family						
Lives with mother, at least part time	82	(95)	498	(97)	580	(97)
Lives with father, at least part time[b]	68	(79)	388	(76)	456	(76)
At least one parent works in agriculture	35	(41)	259	(50)	294	(49)
At least one parent moves for work	17	(20)	70	(14)	87	(15)
Crowded housing conditions[c]	48	(56)	316	(62)	364	(61)
Individual Characteristics						
Female[*]	59	(69)	257	(50)	316	(53)

GED= general equivalency diploma; SD= standard deviation; US = United States

[a]Depression was measured using the PHQ-8, with a score >=10 indicating depression.

[b]In total, 91% (n=544) had contact with their father currently

[c]Definition per US Census Bureau as ≥1 person per room

[*]p-value from Chi-square test <0.05

Table 4.

Estimating the association of each child development factor with depression; *A Crecer*: The Salinas Teen Health Study, 2015-2017 (n=599).

Factor	OR	95% CI	p-value	Adj OR[a]	95% CI	p-value
Promoting and Inhibiting Environments						
School connectedness (score 1-4)	0.15	(0.08, 0.28)	<0.001	0.15	(0.08, 0.29)	<0.001
Neighborhood cohesion (score 1-4)	0.41	(0.26, 0.64)	<0.001	0.41	(0.26, 0.65)	<0.001
Adaptive Culture						
Language acculturation (score 1-5)	1.39	(1.02 - 1.90)	0.04	1.48	(1.08, 2.04)	0.02
Church attendance			0.04			0.03
Never/rarely	Ref	-	-	Ref	-	-
About 1-2 times/month	0.51	(0.28, 0.94)	0.03	0.48	(0.26, 0.89)	0.02
About once a week or more	0.60	(0.35, 1.02)	0.06	0.56	(0.33, 0.97)	0.04
Spirituality (score 1-5)	0.68	(0.54, 0.86)	0.002	0.67	(0.52, 0.85)	0.001
Family						
Parental monitoring (score 1-4)	0.65	(0.46, 0.92)	0.01	0.58	(0.41, 0.83)	0.002
Maternal communication (score 1-4)	0.28	(0.17, 0.44)	<0.001	0.30	(0.19, 0.48)	<0.001
Paternal communication (score 1-4)[b]	0.42	(0.27, 0.67)	<0.001	0.46	(0.29, 0.73)	0.001
Family cohesion (score 1-4)	0.35	(0.21, 0.59)	<0.001	0.36	(0.21, 0.61)	<0.001
Lives with mother, at least part time	0.69	(0.22, 2.13)	0.52			
Lives with father, at least part time[b]	1.24	(0.71, 2.16)	0.46			
At least one parent in agriculture	0.65	(0.40, 1.05)	0.08			
At least one parent moves for work	1.54	(0.85, 2.77)	0.15			
Crowded housing conditions	0.77	(0.48, 1.23)	0.28			
Individual Characteristics						
Age, years	1.13	0.71 - 1.79	0.61			
Female	2.19	1.34 - 3.57	<0.001	2.20	(1.35, 3.59)	0.002

CI=confidence interval; OR=odds ratio

[a]Each model adjusted for age and sex

[b]Limited to participants who reported having contact with their father in the previous six months (n=544)

Table 5.

Estimating the association of each child development factor with depression; *A Crecer*: The Salinas Teen Health Study, 2015-2017 (n=599).

Factor	Individual Models			Hierarchical Modelling								
				Model 1			Model 2			Model 3		
	Adj OR[a]	95% CI	p-value	Adj OR[a]	95% CI	p-value	Adj OR[a]	95% CI	p-value	Adj OR[a]	95% CI	p-value
Promoting and Inhibiting Environments												
School connectedness (score 1-4)	0.15	(0.08, 0.29)	<0.001	0.17	(0.09, 0.32)	<0.001	0.19	(0.10, 0.37)	<0.001	0.22	(0.12, 0.43)	<0.001
Neighborhood cohesion (score 1-4)	0.41	(0.26, 0.65)	<0.001	0.50	(0.30, 0.82)	0.006	0.49	(0.30, 0.81)	0.006	0.48	(0.28, 0.81)	0.007
Adaptive Culture												
Language assimilation (score 1-5)	1.48	(1.08, 2.04)	0.02				1.56	(1.11, 2.20)	0.01	1.63	(1.15, 2.32)	0.007
Church attendance			0.04						0.43			0.70
Never/rarely	Ref	-	-				Ref	-	-			
About 1-2 times/ month	0.48	(0.26, 0.89)	0.02				0.65	(0.33, 1.27)	0.21	0.74	(0.38, 1.47)	0.39
About once a week or more	0.56	(0.33, 0.97)	0.04				0.86	(0.47, 1.59)	0.64	0.91	(0.49, 1.69)	0.76
Spirituality (score 1-5)	0.67	(0.52, 0.85)	0.001				0.85	(0.64, 1.13)	0.27	0.93	(0.68, 1.27)	0.64
Family												
Parental monitoring (score 1-4)	0.58	(0.41, 0.83)	0.002							0.88	(0.57, 1.35)	0.56
Maternal communication (score 1-4)	0.30	(0.19, 0.48)	<0.001							0.47	(0.26, 0.84)	0.01
Family cohesion (score 1-4)	0.36	(0.21, 0.61)	<0.001							1.12	(0.55, 2.27)	0.76
Paternal communication (score 1-4)[b]	0.46	(0.29, 0.73)	0.001									
Lives with mother, at least part time	0.67	(0.21, 2.10)	0.49									
Lives with father, at least part time[b]	1.28	(0.73, 2.25)	0.39									
At least one parent in agriculture	0.64	(0.39, 1.03)	0.07									
At least one parent moves for work	1.53	(0.84, 2.78)	0.16									
Crowded housing conditions	0.75	(0.47, 1.21)	0.25									
Individual Characteristics												

	Individual Models			Hierarchical Modelling								
				Model 1			Model 2			Model 3		
Factor	Adj OR[a]	95% CI	p-value	Adj OR[a]	95% CI	p-value	Adj OR[a]	95% CI	p-value	Adj OR[a]	95% CI	p-value
Age, years	1.16	(0.72, 1.87)	0.54	1.09	(0.66, 1.80)	0.74	1.13	(0.67, 1.89)	0.64	1.13	(0.67, 1.92)	0.64
Female	2.20	(1.35, 3.59)	0.002	2.12	(1.27, 3.56)	0.004	2.31	(1.36, 3.91)	0.002	2.28	(1.32, 3.94)	0.003

CI=confidence interval; OR=odds ratio

[a]Each model adjusted for age, sex, and recruitment school

[b]Limited to participants who reported having contact with their father in the previous six months (n=544); not included in hierarchical modelling because of loss of sample