Acculturative Stress, Resilience, and a Syndemic Factor Among Latinx Immigrants

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Background: The process of immigration and subsequent adaptation can expose Latinx immigrants to chronic and compounding challenges (i.e., acculturative stress), but little is known about how resilience factors and these stressors interact to influence syndemic conditions, intertwined epidemics that disproportionly affect historically marginalized communities.

Objectives: The purpose of this study was to describe the influence of acculturative stress and resilience on the syndemic factor underlying substance abuse, intimate partner violence, HIV risk, and mental conditions.

Methods: Baseline cross-sectional data from a community-engaged, longitudinal study of 391 adult (ages 18–44 years) Latinx immigrants in North Carolina were obtained using standardized measures available in English and Spanish. Structural equation modeling tested the syndemic model, and random forest variable importance identified the most influential types of acculturative stressors and resilience factors, including their interactions, on the syndemic factor.

Results: Results indicated that a single syndemic factor explained variations in heavy drinking, drug use, intimate partner violence, depression, and anxiety and fit the data well. Age, being a woman, acculturative stress, acculturation to the United States, and emotional support were significantly related to the syndemic factor. The relationship between acculturative stress and the syndemic factor was buffered by ethnic pride, coping, enculturation, social support, and individual resilience. The most influential acculturative stressors were marital, family, and occupation/economic stress.

Discussion: Findings from this study underscore the importance of considering the co-occurrence of behavioral and mental health conditions among Latinx immigrants. Health promotion programs for Latinx immigrants should address acculturative stress and bolster ethnic pride, social support, and coping as sources of resilience.

Key Words: Hispanic or Latino ● psychological ● stress ● syndemic

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L atinx (i.e., gender-inclusive term to describe Hispanic or Latino/a) immigrants in the United States are a historically oppressed group who experience an emergence of poorer behavioral, mental, and physical health outcomes over time and across generations (Lommel & Chen, 2016; Velasco-Mondragon et al., 2016). For example, Latinx immi-

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grants who have lived in the United States for a larger proportion of their lives report more substance abuse, intimate partner violence (IPV), immunodeficiency virus (HIV) risks, and depressive symptoms (González-Guarda et al., 2012). Evidence suggests that these conditions are highly interrelated and co-occur among Latinx immigrants and other socially oppressed groups to comprise syndemic disease clusters exacerbating health disparities that emerge from underlying oppressive structures such as poverty, stressful environments, and structural racism (Singer et al., 2017). Understanding the underlying conditions in which syndemic emerge for Latinx communities in the United States is critical in promoting population health equity.

Acculturation—the multidimensional process of adapting to a new culture and environment—has been associated with health disparities among Latinx immigrants; however, little is known about how the acculturation process drives the emergence of syndemic conditions (Bekteshi & Kang, 2020). Chronic exposure to stress is a social determinant of health that may have particular relevance for racial and ethnic minoritized communities. However, little attention has been given to describing the effect that the stress associated with

the acculturation process, known as acculturative stress, has on health outcomes among Latinx immigrants (Cervantes et al., 2016). Furthermore, not enough consideration has been given to understanding how sources of resilience, such as ethnic pride and family and social support, buffer against the negative effects of acculturative stress on co-occurring health outcomes (i.e., syndemics). This knowledge base is critical in developing evidence-based strategies to promote the health and well-being of Latinx communities, the largest minoritized racial/ethnic group in the United States (U.S. Census Bureau, 2021).

The purpose of this study was to examine the relationship among acculturative stress, resilience, and the syndemic indicators of substance abuse, IPV, HIV risk, and mental health conditions in a community sample of adult Latinx immigrants in the United States. Specifically, we aimed to do the following:

1. test a theoretical measurement model that a single syndemic factor explains variation in heavy drinking, drug use, IPV, depression, anxiety, and sexual risk;
2. examine the influence of acculturative stress and potential sources of resilience on the syndemic factor; and
3. identify the most important moderators of the relationship between acculturative stress and the syndemic factor, as well as the most significant subtypes of acculturative stress related to the syndemic factor.

Syndemic Framework

A syndemic (co-occurring epidemics) orientation considers social factors, such as discrimination and marginalization, that promote disease clustering for distinct populations, affecting disease pathologies in individuals. The core features of a syndemic approach include (a) the clustering of two or more diseases within a population; (b) the biological, social, and psychological interaction of those diseases; and (c) the large-scale social forces that precipitate disease clustering in the first place (Mendenhall, 2017). Inherent in this approach is an understanding of the intersection of multiple systems of oppression that affect marginalized communities, such as poverty, racism, social exclusion, or other forms of social and environmental stress, and how they, in turn, exacerbate, escalate, or amplify diseases within these populations. In this way, a syndemic approach allows researchers and practitioners to identify common root causes of health disparities in marginalized communities and inform a range of interventions to improve equity across social and health conditions.

One notable syndemic pertinent for Latinx immigrants is the substance abuse, IPV, HIV, and mental health syndemic, originally conceptualized by Singer (2000) and operationalized and tested by González-Guarda et al. (González-Guarda, Florom-Smith, & Thomas, 2011; González-Guarda, McCabe, et al., 2011). In recognition of the fact that Latinx immigrants disproportionately experience consequences of heavy drinking, IPV, HIV, and mental health problems, González-Guarda, Florom-Smith, and Thomas (2011) uncovered individual factors (e.g., employment, lack of health insurance), cultural factors (e.g., acculturation, acculturative stress), relationship factors (e.g., family conflict, connection to community organizations/institutions), and socioenvironmental factors (e.g., discrimination, access to culturally sensitive services, poverty) that serve as risk and protective factors for this syndemic among diverse groups of Latinx immigrants (González-Guarda, McCabe, et al., 2011; González-Guarda et al., 2016). Notably, this syndemic was found to be more common among immigrants who lived a larger proportion of their lives in the United States (González-Guarda, McCabe, et al., 2011). Of all the social factors explored, acculturative stress, the stress of being a Latinx immigrant in the United States, and adapting to a new context were the strongest predictors of the syndemic outcomes; however, family support helped to buffer these effects (González-Guarda et al., 2016). Nevertheless, syndemics research has mainly been conducted in established immigrant-receiving communities such as Miami and New York City with Latinx majorities or an established history (González-Guarda, Florom-Smith, & Thomas, 2011; Martinez et al., 2016). Less is known about syndemics in more recent Latinx immigrant-receiving communities in the U.S. South, where the legacy of slavery and anti-immigrant sentiments may contribute to additional marginalization.

METHODS

Design

This study used baseline data collected between May 2018 and July 2020 from a longitudinal, community-engaged research study of young adult Latinx immigrants in the Research Triangle region (Durham, Raleigh, and Chapel Hill) of North Carolina ($N = 391$; described in more detail in Nagy et al., 2021). All staff was bilingual and bicultural, and all study-related materials were available in both English and Spanish. Institutional review board approval was obtained through the academic partnering institution.

Sample and Setting

This study took place in a recent Latinx immigrant-receiving region in the U.S. South. To be eligible to participate in the study, candidates needed to identify as Hispanic or Latino/a, have emigrated from a Spanish-speaking country in Latin America or the Caribbean, and be between 18 and 44 years old. This age range was selected because it is within the range of most immigrants arriving in the United States (Budiman et al., 2020). Participant characteristics are in Table 1. People who planned to move away from the Research Triangle (i.e., the Durham–Raleigh–Chapel Hill area of North Carolina) within the 2-year study period were excluded from participation because the data collection strategies did not allow for follow-up outside the region.

TABLE 1. Participant Characteristics (*N* = 391)

Characteristic	*M*	*SD*	Range
Age, years	33.86	6.94	18–45
Education	11.45	4.00	0–18
Acculturative stress	23.32	14.13	0–68
Enculturation/Hispanicism	3.42	0.35	2.08–4.00
Acculturation/Americanism	2.54	0.85	1.00–4.00
Emotional support	49.37	9.25	24.70–63.50
Instrumental support	49.59	8.82	27.00–65.60
Ethnic identity	3.03	0.59	0.17–4.00
Familism	3.49	0.46	2.07–5.00
IPV	1.80	2.24	0–11
Depression	5.25	4.85	0–25
Anxiety	7.01	5.19	0–21
	n	%	
Gender (female)	269	69	—
Heavy drinking	143	37	—
Drug use	28	7	—
Consistent condom use	42	11	—
Multiple sexual partners	35	9	—

Note. IPV = intimate partner violence.

Procedures

Participants were scheduled for a baseline assessment at their homes or a community office based on preference. Assessors administered the battery of self-reported measures by reading the questions from an electronic tablet and demonstrating the response options to the participants according to their language preference through REDCap (Harris et al., 2009). This strategy helped to address any concerns related to health literacy. Participants were also provided with the opportunity to self-administer the measures if they preferred, although the majority preferred the assessor-administered survey. The interview took about 2 hours to complete. Participant burden was addressed by taking breaks as needed and providing compensation ($50). Several safety protocols were implemented to ensure that participants were safe if there were high levels of depressive symptoms or dangerousness of IPV. This included additional screening for suicidality if depressive symptoms or suicidal ideation was disclosed using the Colombia Suicide Severity Index (Posner et al., 2011) and the implementation of the Danger Assessment-5 (Snider et al., 2009). Safety planning was conducted with participants when there were safety concerns.

Measures

Demographics
We assessed age and education in years and gender, coded as 1 = *woman* (vs. 0 = *man*).

Enculturation/Acculturation
The Bidimensional Acculturation Scale (Marin & Gamba, 1996) has 24 items over two dimensions: affinity with practices of the culture of origin (enculturation/Hispanicism) and affinity with practices of the receiving culture (acculturation/Americanism). The total score for each is defined as the mean of 12 items, resulting in a potential range of 1–4. In this sample, both the enculturation/Hispanicism and acculturation/Americanism subscales had satisfactory internal consistency (α = .70 and .96, respectively).

Syndemic Indicators

Heavy Drinking
Heavy drinking was measured with a single item from the U.S. Alcohol Use Disorders Identification Test, a revised version of the widely used alcohol screening measure (Babor et al., 2017). Heavy episodic drinking was coded as 0 = *never* versus 1 = *any in the past 6 months*.

Drug Use
Drug use was assessed with a single item from the Drug Abuse Screening Test (Skinner, 1982), "Have you used drugs other than those required for medical reasons?" over the previous 6 months. Example classes of drugs were cannabis (e.g., marijuana, hashish), solvents (e.g., paint thinner), tranquilizers (e.g., Valium), barbiturates, cocaine, stimulants (e.g., speed), hallucinogens (e.g., lysergic acid diethylamide), or narcotics (e.g., heroin) and included prescribed or over-the-counter drugs used in excess of directions.

Intimate Partner Violence
IPV was assessed with the revised short form of the Conflict Tactics Scale (Straus & Douglas, 2004) that was adapted for immigrants in this study by reducing the number of items, simplifying wording, and shortening the response scale from eight options to four (*never, one time, two times*, or *three or more times*). The measure assesses the frequency of 12 behaviors in the past 6 months (e.g., insulted you, beat you up, forced you to have sex), which are summed for a total score of experienced IPV. Internal consistency was good in this sample, α = .87. IPV was positively skewed and entered as a count variable with negative binomial parameters in the analysis.

Depression
Depression was assessed with the widely used Patient Health Questionnaire (Kroenke & Spitzer, 2002), a nine-item scale about symptoms within the prior 2 weeks. Items were rated using a 4-point Likert scale ranging from 0 = *not at all* to 3 = *nearly every day*. The measure has good internal consistency, α = .86, and higher scores mean greater severity. In this sample, depressive symptoms were positively skewed and entered as a count variable with negative binomial parameters in the analysis.

Anxiety
Anxiety was assessed with the widely used Generalized Anxiety Disorders-7 (Spitzer et al., 2006), a seven-item scale of symptoms of generalized anxiety disorder over a 2-week period. Participants rate symptoms on a 4-point scale from

$0 = $ *not at all* to $3 = $ *nearly every day*. Higher scores indicated greater symptoms; the scale had strong internal consistency in this sample, $\alpha = .90$. Anxiety was positively skewed and entered as a count variable with negative binomial parameters in analysis.

Sexual Risk

Sexual risk was measured in two ways: consistent condom use and multiple sexual partners in the last 6 months. First, participants reported the frequency of condom use during penetrative sex (vaginal and anal) with their most recent or main partner. *Consistent condom use* was defined as reporting "always" using condoms, $1 = $ *always*, $0 = $ *sometimes or never*. Participants also reported on the number of sexual partners over the past month. *Multiple sexual partners* were defined as $1 = $ *two or more partners*, $0 = $ *zero or one partner*. Both measures were similar to measures used in past research on the syndemic factor with Latinx communities (e.g., González-Guarda et al., 2016).

Acculturative Stress Acculturative stress was assessed with the Hispanic Stress Inventory-2 Immigrant Version (Cervantes et al., 2016), which measures 10 subtypes of acculturative stress with 90 items: parental stress (13 items), occupation and economic stress (12 items), marital stress (12 items), discrimination stress (11 items), immigration-related stress (9 items), marital acculturation gap stress (9 items), health stress (8 items), language-related stress (6 items), pre-migration stress (6 items), and family-related stress (5 items). Participants report whether an event occurred in the past 6 months (*frequency*) for each item. For analysis, we defined total *acculturative stress* as the total count/frequency (potential range of 0–90) of stressful events and frequency of each subscale. For all scales, higher scores mean more stress; internal consistency was strong for total stress, Cronbach's $\alpha = .93$, and acceptable for subscales, αs = .63–.82.

Resilience Measures

Ethnic Identity

The Multigroup Ethnic Identification Measure (Phinney, 1996) has 12 items on a 5-point Likert scale, from $1 = $ *strongly disagree* to $5 = $ *strongly agree*. This measure assesses a participant's heritage culture identification, that is, how much one (a) has considered the subjective meaning of one's race/ethnicity and (b) feels positive about one's racial/ethnic group. A single ethnic identity total score was created by averaging items, with a possible range from 1 to 5. Higher scores meant greater identification with Latinx/Hispanic culture, and the scale had strong internal consistency reliability in this sample ($\alpha = .90$).

Familism

The 15-item Familism Scale (Sabogal et al., 1987) is on a 5-point Likert scale, from $1 = $ *strongly disagree* to $5 = $ *strongly agree*.

This measure assessed three cultural values: familial obligations, family support, and family as referents. Items were averaged into a single familism scale, with a potential range of 1–5, with acceptable internal consistency reliability ($\alpha = .76$).

Social Support

Social support was assessed with the *Emotional Support* (eight items) and *Instrumental Support* (eight items) scales from the Adult Social Relationship Inventory from the NIH Toolbox (Cyranowski et al., 2013). Items are on a 5-point Likert scale, from $1 = $ *never* to $5 = $ *always*. The Emotional Support scale assesses the availability of people to listen with empathy, caring, and understanding. The Instrumental Support scale assesses the availability of functional help for common tasks. Both scales had strong internal consistency in this sample ($\alpha = .95$ and $\alpha = .93$, respectively) and can be compared to the norming sample using standard T scores ($M = 50$, $SD = 10$) following instructions by measure developers.

Individual Resilience

Individual resilience was measured with the 25-item Resilience Scale (Heilemann et al., 2003), adapted for Latinx participants from Wagnild and Young (1990). Items are on a 7-point Likert scale, from $1 = $ *strongly disagree* to $7 = $ *strongly agree.* Items are characterized as positive personality traits, including self-reliance, determination, independence, resourcefulness, adaptability, flexibility, and balanced perspective. The measure had strong internal consistency reliability ($\alpha = .92$).

Coping

Coping was assessed with six scales created from items on the Brief COPE (Carver, 1997), with 28 items about how participants respond to stressful events. Item responses are rated on a 4-point scale, ranging from $1 = $ *I didn't do this at all* to $4 = $ *I did this a lot*. The coping scales in this study were as follows:

1. *Active Coping* (e.g., positive reframing, planning),
2. *Support Coping* (e.g., talking with others about problems),
3. *Avoidant Coping* (e.g., thought suppression, denial, venting),
4. *Humor Coping* (e.g., joking about the problem),
5. *Religious Coping* (e.g., praying, meditating), and
6. *Substance Use Coping* (e.g., using alcohol or drugs to feel better).

In this sample, the internal consistency reliability of these scales was satisfactory, αs = .78–.94.

Analysis Plan

The analysis had three steps:

1. confirmatory factor analysis (CFA) of a theorized latent syndemic factor;
2. structural equation modeling (SEM) testing potential predictors of the syndemic latent factor; and
3. variable importance (VIMP) using a Random Forest machine learning technique to test relationships between subtypes or acculturative stress and interactions.

Mplus 8 (Muthén & Muthén, 1998–2017) was used in Steps 1 and 2 because it allowed for modeling continuous

and categorical indicators with a weighted least square parameter estimator using a diagonal weight matrix with standard errors and mean and variance adjusted chi-square test statistic with a full weight matrix.

In Step 1, CFA or measurement modeling was used to test the a priori theory that depression, anxiety, IPV, sexual risk, heavy drinking, and drug use could be modeled as aspects of a single underlying phenomenon (i.e., a latent syndemic factor). In Step 2, we used SEM to test the relationships between theoretical predictors (i.e., age, gender, education, acculturative stress, and resilience factors) and the syndemic factor from Step 1. Model fit in both Steps 1 and 2 was assessed with the χ^2 test, comparative fit index (CFI), and root-mean-square error of approximation (RMSEA). Good fit with the χ^2 is a nonsignificant result ($p > .05$). We used cutoffs of CFI > .90 and RMSEA < .08 to indicate acceptable fit.

In Step 3, VIMP Random Forest models were implemented in the open-source R software using the *randomForestSRC* R package (Ishwaran et al., 2021a, 2021b). The function *rfsrc* was used for building the prediction model under default setting with 1,000 trees and the option *na.action = "na.impute"* for missing data imputation. Inferences of VIMP were estimated using the function *subsample* with 1,000 subsamples; the ratio for subsampling approach was increased to 20% because of small sample size. Functions *cor.test* and *lm* were used to calculate correlation and regression coefficients whose signs were used to indicate the direction of association.

Estimated VIMP (Breiman, 2001) was adopted to test main and moderating effects, which utilizes a prediction-based approach by estimating prediction error attributable to each predictor. The out-of-bag data were used to estimate the cross-validated mean squared error as prediction error. The VIMP is useful to rank predictors and can be interpreted as the increase in the prediction error when the corresponding predictor is randomly permutated into a noise variable. Positive VIMP values indicate predictive variables adjusted for all other variables, and the estimated VIMP coefficient indicates the proportion of improved prediction of the outcome in terms of standardized mean squared error. Zero or negative VIMP indicated unpredictive variables that cause model overfitting, not an inverse relationship to the outcome as in traditional regression analyses. The direction of association between the outcome and each predictor was calculated separately with a correlation coefficient; positive meant that a higher level of the predictor was more likely with a higher value of syndemic factor, but negative meant that a higher level was associated with a lower value. Standard errors and *p*-values are generated by a delete-*d*-jacknife procedure (Ishwaran & Lu, 2019; Ishwaran et al., 2021b). Products of predictors were added to test potential moderators of the relationship between acculturative stress and the syndemic factor. To inform their directions, we standardized each predictor and subtracted its minimum value so that their values and products were all pos-

itive and relatively comparable. For the moderating effect of x_2 on x_1, we fit linear regression $y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_1 x_2$, and the sign of β_3 was used to inform the direction of the moderating effect. If the direction of association between the outcome and x_1 is positive, a negative sign of β_3 indicated that the effect of x_1 was buffered by x_2. We interpreted a positive sign of interaction to mean intensifying the relationship between acculturative stress and the syndemic factor and negative as a buffering interaction.

RESULTS

Step 1. Syndemic Factor Measurement Model (CFA)

We first tested a measurement model with CFA that tested a single syndemic factor explaining variation in several indicators: heavy drinking, drug use, IPV, depression, anxiety, condom use, and multiple sexual partners. The initial model did not fit well, $\chi^2(df = 14) = 39.98$, $p < .001$, CFI = .872, RMSEA = .069. Neither consistent condom use, $b = 0.01$, $SE = 0.03$, $p = .152$, nor multiple sexual partners, $b = 0.14$, $SE = 0.10$, $p = .152$, were related to the syndemic factor, so they were removed from the model. A modified model also did not fit well, $\chi^2(df = 5) = 42.03$, $p < .001$, CFI = .812, RMSEA = .138, but all variables loaded significantly on the syndemic factor: heavy drinking, $b = 0.22$, $SE = 0.06$, $\beta = .32$, $p = .001$; drug use, $b = 0.30$, $SE = 0.11$, $\beta = .44$, $p = .008$; IPV, $b = 0.48$, $SE = 0.06$, $\beta = .60$, $p < .001$; depression, $b = 0.49$, $SE = 0.06$, $\beta = .70$, $p < .001$; and anxiety, $b = 0.42$, $SE = 0.06$, $\beta = .65$, $p < .001$. Modification indices suggested two error covariances: heavy drinking with drug use, $b = 0.44$, $SE = 0.11$, $\beta = .51$, $p < .001$, and depression with anxiety, $b = 0.48$, $SE = 0.12$, $\beta = .42$, $p < .001$. With these additions, the final CFA model had good fit, $\chi^2(df = 3) = 3.62$, $p = .306$, CFI = .997, RMSEA = .023, and 11% of variation in heavy drinking, 9% in drug use, 52% in IPV, 32% in depression, and 22% in anxiety.

Step 2. Predictors of the SEM Factor

We then tested an SEM with the 10 potential syndemic factor predictors identified in Step 1. The initial model did not fit well, $\chi^2(df = 43) = 79.58$, $p < .001$, CFI = .892, RMSEA = .047. A single path from gender to heavy drinking, $b = -0.60$, $SE = 0.17$, $p < .001$, was suggested by modification indices. With this addition, the final SEM model had adequate fit, $\chi^2(df = 42) = 68.57$, $p = .006$, CFI = .922, RMSEA = .041, and explained 60% of variation of the latent syndemic factor. Significant predictors of the syndemic factor were age, $b = -0.04$, $SE = 0.01$, $\beta = -.18$, $p = .004$; gender, $b = 0.38$, $SE = 0.18$, $\beta = .11$, $p = .036$; acculturative stress, $b = 0.07$, $SE = 0.01$, $\beta = .60$, $p < .001$; acculturation/Americanism, $b = 0.33$, $SE = 0.15$, $\beta = .18$, $p = .001$; and emotional support, $b = -0.04$, $SE = 0.01$, $\beta = -.24$, $p = .001$. Figure 1 shows this model with significant predictors of the syndemic factor.

Step 3a. Potential Moderators (VIMP)

We fitted a VIMP Random Forest model with 16 potential moderators of the relationship between acculturative stress and the syndemic factor (i.e., 33 variables in the model, including all predictors). The model predicted the syndemic factor well: The out-of-bag prediction error in terms of mean squared error is 0.64. Table 2 shows the results. Acculturative stress was the most influential for predicting the syndemic factor, VIMP = 5.54, SE = 1.8, p = .001, and resilience was the second most, VIMP = 2.48, SE = 1.27, p = .025, followed by avoidant coping, VIMP = 1.21, SE = 0.7, p = .043. In order of importance, education, avoidant coping, and age intensified the relationship between acculturative stress and the syndemic factor. The relationship between acculturative stress and the syndemic factor was buffered, in order of importance, by ethnic identity, substance use coping, active coping, enculturation (Hispanicism), emotional support, resilience, and instrumental support.

Step 3b: Acculturative Stress Subtypes (VIMP)

After including other predictors, we fitted a separate Random Forest model with 10 acculturative stress subtypes or 19 variables in total. The model predicted the syndemic factor well: The out-of-bag prediction error in terms of mean squared error was 0.44. The results are in Table 3. The most influential acculturative stress types were marital stress, VIMP = 10.75, SE = 3.19, p < .001; family stress, VIMP = 8.43, SE = 2.59,

p < .001; and occupation and economic stress, VIMP = 3.92, SE = 1.70, p = .011.

DISCUSSION

The study provides a nuanced understanding of how acculturative stress and resilience work together to influence a syndemic factor explaining variation in substance abuse, IPV, sexual risk, and mental health symptoms among Latinx immigrants in a more recent immigrant-receiving community. To our best knowledge, this study is the first to use advanced machine learning techniques and complex moderation analyses to identify the most important sources of acculturative stress and resilience that influence co-occurring behavioral and mental health conditions of Latinx immigrants. Our findings underscore the influential role that acculturative stress plays in influencing syndemic outcomes and identified multiple sources of resilience that served as buffers according to their level of influence. This study's findings can guide precise health-promoting interventions for Latinx immigrants to prevent decaying health over time.

Similar to other studies conducted with Latinx communities in more established immigrant environments, we found evidence to support a syndemic factor (González-Guarda et al., 2012, 2016). However, in this study, sexual risk did not fit the measurement model well and was therefore removed. This may have been because sexual risk was very low in this
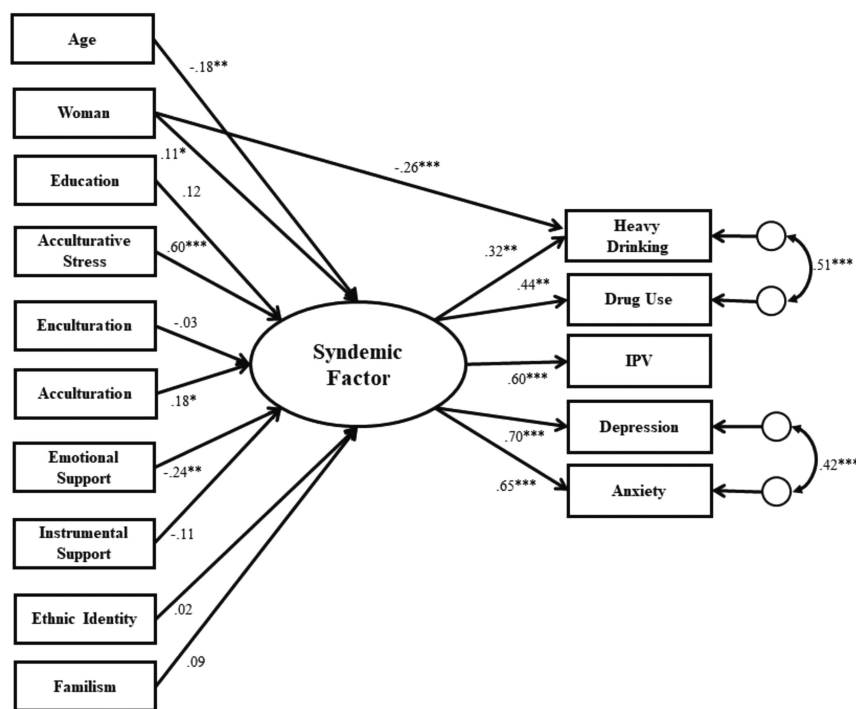

FIGURE 1. Results of the structural equation modeling model. The left side of the diagram shows standardized coefficients representing relationships between hypothesized predictors of the syndemic factor. The right side shows the relationships in the syndemic factor measurement model. These loadings differ slightly from the model that did not include predictor variables. This model had an acceptable fit to the data. $\chi^2(df = 42) = 68.57$, p = .006, **CFI = .922, RMSEA = .041. *p < .05, **p < .01, ***p < .001.**

TABLE 2. Estimated Variable Importance (VIMP) for Potential Moderators of the Relationship Between Acculturative Stress and the Syndemic Factor

Variables	VIMP	*SE*	*p*	Direction of influence
Acculturative stress	5.54	1.80	.001	+
Age	0.18	0.36	.311	−
Gender (1 = female, 0 = male)	0.00	0.07	.512	+
Education	0.09	0.24	.354	+
Enculturation (Hispanicism)	−0.09	0.31	.619	−
Acculturation (Americanism)	−0.07	0.24	.610	+
Emotional support	1.07	0.87	.110	−
Instrumental support	1.08	0.69	.059	−
Familism	0.11	0.22	.316	+
Ethnic identity	0.28	0.27	.146	−
Resilience	2.48	1.27	.025	−
Active coping	0.57	0.36	.055	+
Support coping	0.20	0.30	.253	−
Avoidant coping	1.21	0.70	.043	+
Humor coping	0.08	0.19	.348	+
Religious coping	0.12	0.20	.270	+
Substance use coping	0.76	0.59	.097	+
Acculturative Stress × Age	0.52	0.30	.045	+
Acculturative Stress × Gender	0.55	0.52	.147	−
Acculturative Stress × Education	6.04	2.03	.001	+
Acculturative Stress × Enculturation (Hispanicism)	0.97	0.58	.048	−
Acculturative stress × Acculturation (Americanism)	1.17	1.17	.159	+
Acculturative Stress × Emotional Support	0.58	0.32	.033	−
Acculturative Stress × Instrumental Support	0.54	0.31	.039	−
Acculturative Stress × Familism	0.27	0.65	.336	+
Acculturative Stress × Ethnic Identity	3.05	1.06	.002	−
Acculturative Stress × Resilience	0.77	0.33	.011	−
Acculturative Stress × Active Coping	1.33	0.56	.009	−
Acculturative Stress × Support Coping	0.18	0.21	.193	−
Acculturative Stress × Avoidant Coping	5.46	1.69	<.001	+
Acculturative Stress × Humor Coping	0.64	0.87	.231	+
Acculturative Stress × Religious Coping	0.13	0.47	.393	+
Acculturative Stress × Substance Use Coping	1.71	0.90	.029	−

Note. VIMP = estimate is contribution to prediction accuracy, with negative sign meaning uninformative. R^2 = .36.

sample, with the vast majority of participants having one sexual partner and not engaging in consistent condom use. Furthermore, findings from the Random Forest analyses identified the most important predictors of the syndemic factor, including age, gender, acculturative stress, acculturation/ Americanism, and emotional support. As reported previously, acculturative stress had the biggest effect on the syndemic factor (González-Guarda et al., 2012, 2016). Expanding on past studies, marital and family stress were the most influential subtypes of acculturative stress on the syndemic factor. These two interrelated stressors appear to be prime foci for interventions to prevent multiple health conditions among Latinx immigrants.

The findings from this study extend our understanding of resilience in the context of acculturative stress and as potential counter syndemics. Findings identified individual resilience as a buffer to the deleterious effects of acculturative stress on syndemic outcomes for Latinx immigrants. Characteristics related to individual resilience can be used to identify subpopulations in greatest need of intervention or more amendable to certain types of intervention strategies. Beliefs, attitudes, and skills contributing to resilience (e.g., mindfulness strategies, cognitive–behavioral therapy) have been effectively improved in other populations (Joyce et al., 2018); they can be adapted and tested within the context of addressing acculturative stress. Furthermore, unlike previous findings from research conducted in more established Latinx-receiving communities, enculturation/Hispanicism and ethnic pride did not have an initial direct protective effect on behavioral and mental health outcomes (González-Guarda et al., 2012; Upadhyayula et al., 2017). This may be because a strong cultural identity is more protective in a more Latinx immigrant-friendly context such

TABLE 3. Estimated Variable Importance (VIMP) for Relationship Between Types of Acculturative Stress and the Syndemic Factor

Variable	VIMP	SE	p	Direction of influence
Age	1.08	0.65	.048	−
Gender (1 = female, 0 = male)	−0.02	0.16	.553	+
Education	0.62	0.45	.085	+
Enculturation (Hispanicism)	−0.13	0.40	.630	−
Acculturation (Americanism)	−0.15	0.44	.628	+
Emotional support	1.59	1.15	.085	−
Instrumental support	0.70	0.83	.201	−
Familism	−0.05	0.35	.554	+
Ethnic identity	0.18	0.37	.309	−
Parental stress	0.20	0.41	.316	+
Occupation and economic stress	3.92	1.70	.011	+
Marital stress	10.75	3.19	<.001	+
Discrimination stress	0.35	0.78	.329	+
Immigration stress	−0.02	0.72	.512	+
Marital acculturation gap stress	0.55	1.05	.300	+
Health stress	−0.07	0.62	.544	+
Language-related stress	0.26	0.36	.236	+
Premigration stress	−0.28	0.49	.717	+
Family stress	8.43	2.59	<.001	+

Note. VIMP = estimate is contribution to prediction accuracy, with negative sign meaning uninformative. R^2 = .36.

as ethnic enclaves (Bekteshi & Kang, 2020). These complex interactions between individual-, family-, and community-level sources of resilience need to be further examined.

Significant interactions were noted when acculturative stress and resilience were considered in moderation analyses. Education, avoidant coping, and age enhanced the effect that acculturative stress had on the syndemic factor. On the other hand, several of the resilience variables buffered against these effects. These included ethnic pride, active coping, emotional and instrumental support, and individual resilience. To our surprise, substance use coping buffered against the effects of acculturative stress. This may result from more normative drinking behaviors among Latino immigrant men, especially as a means of coping with occupational-related stressors and other acculturation stressors, which were high in this population (Armeli et al., 2003; González-Guarda et al., 2016). More research is needed to understand this phenomenon.

This study has several limitations inherent to cross-sectional designs (e.g., inability to draw causal inferences). In addition, the sample included Latinx immigrants who were predominately female, Spanish-speaking, and lived in a more recent immigrant-receiving community. Caution must be taken when generalizing findings to other Latinx immigrant communities across the country. Finally, acculturation, acculturative stress, and resilience are all complex phenomena. Although this study employed a thorough measurement plan to collect data about these multidimensional processes and experiences, it may oversimplify the experience of immigration and health. Future research should include mixed-methods designs and observational and biological measures to provide richer contextual information.

Conclusion

This study identified the cumulative effect that acculturative stress and resilience have on a syndemic factor in a sample of Latinx immigrants and added to the literature regarding the most influential sources of acculturative stress and resilience. Culturally based marital and family stress, acculturation to the United States, and lack of access to emotional coping emerged as key risk factors. Individual resilience, ethnic pride, active coping, and emotional and instrumental support served as protective factors that buffered against the effects of acculturative stress. Comprehensive strategies are needed to address acculturative stress and promote resilience of Latinx immigrants to prevent the emergence of health disparities.

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