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The differential relationship of common health comorbidities with acculturative experiences in United States Latinxs

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1. Introduction

Latinxs are the largest racial/ethnic minority group in the United States (US), with a population that is steadily increasing (Colby & Ortman, 2015, p. 13). Although the "Latinx/Hispanic Health Paradox" – the phenomenon that US Latinxs have better health outcomes than non-Latinx/Hispanic Whites despite increased poverty and other risk correlates – has been well-documented in the epidemiologic literature (Alcántara et al., 2017), understanding Latinx health is complex. Not all diseases exhibit this paradox. Compared with non-Latinx Whites, Latinxs are at higher risk for certain illnesses, such as diabetes (Centers for Disease Control and Prevention [CDC], 2015; Centers for Disease Control and Prevention [CDC], 2019; Dominguez et al., 2015). Further, this health advantage exhibited by foreign-born immigrants declines with time spent in the US and for successive US-born generations (Alcántara et al., 2017). However, important within-group differences are obscured when treating Latinxs as a homogenous group. For example, substantial epidemiologic evidence documents increased mental health problems among Puerto Ricans as compared to other Latinx subgroups (Alegría et al., 2007a, 2008; Camacho et al., 2015; Fortuna et al., 2007; Perreira et al., 2015; Wassertheil-Smolle et al., 2014). Variations in physical health conditions such as diabetes have also been documented (Centers for Disease Control and Prevention [CDC], 2015; Schneiderman et al., 2014). The reason for these differences remain unclear.

The impact of acculturation, or "the multidimensional process of the adoption of US cultural norms, values, and lifestyles" (Alegría, 2009; Lara et al., 2005), is important to consider when evaluating within-group health disparities. While initially conceptualized as a group process (Redfield et al., 1936), Graves (1967) used the concept of psychological acculturation to address changes in beliefs, values, identity and behavior at the individual rather than sociological level (Berry et al., 2017). Additionally, acculturation was originally operationalized as a unidimensional construct more appropriately termed "assimilation" (the idea that the migrant forsakes the ways of their home culture as they adopt those of the new one). Acknowledging the limitations of this approach, acculturation scholars have advocated for a more nuanced definition to more appropriately account for the complex nature of the process (Alegría, 2009; Schwartz et al., 2010; Thomson & Hoffman-Goetz, 2009). Berry's (1997) seminal work revolutionized acculturation measurement, noting that the traditional, simplistic, and unidimensional construct of assimilation fails to account for the varied ways immigrants engage in adaptation in their host country. Thus, to allow for bicultural migrants, he incorporated enculturation, or the process through which migrants continue to identify with their culture of origin (Guarnaccia et al., 2007), as a second dimension that is independent of the first. Using this bidimensional definition, immigrants can be classified into four broad acculturative groups that describe how they adapt to life in a new culture: assimilated, integrated, marginalized, and

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separated. More recently, scholars have noted that acculturation is likely multidimensional, and should also include the interactional context in which an immigrant is located (Schwartz et al., 2010). Several reviews of the vast extant literature on acculturation theory and measurement are available for a more thorough discussion (Abraído-Lanza et al., 2006, 2016; Berry et al., 2017; Schwartz et al., 2010).

The relationship between acculturation and health has received substantial attention in the literature. Risk for physical and psychiatric disorders has consistently been shown to vary by nativity, English language, or time spent in the US. (Alegría et al., 2006, 2007b; O'Brien et al., 2014) These measures are often used in acculturation research, but are criticized as overly-simplistic proxies (Alegría, 2009). Nevertheless, many studies continue to rely on unidimensional definitions and acculturation proxies (Thomson & Hoffman-Goetz, 2009), and/or do not consider variations in disease risk by important Latinx subgroups such as heritage or generational status (Alegría et al., 2007a). Additionally, while acculturation is often measured at an individual level, the process of acculturation intersects multiple socio-ecological levels (Bronfenbrenner, 1979), including contextual experiences occurring at the relationship, community, and societal levels (Center for Disease Control and Prevention [CDC], 2004, p. 16). In addition to changes in language or ethnic identity, US-residing Latinxs have distinct acculturative experiences, such as discrimination, family conflict, and neighborhood context. These experiences, occurring at "meso" levels of influence (Schnittker & McLeod, 2005), conceptualized here as the relationship and community levels, are inextricably linked to the acculturation process (Psychological Association, 2012) and vary by Latinx subgroup (Almeida et al., 2016; Arellano-Morales et al., 2015; Lui, 2015; Torres et al., 2012). Although most studies treat acculturation and acculturative experiences as independent processes, recent research has identified distinct acculturative groups of US Latinxs that are primarily defined by these "meso" or contextual acculturative experiences rather than common acculturation measures that focus on the individual (Roth et al., 2019). Like ethnic and generational subgroups, Latinx acculturative classes exhibit varying psychiatric disorder prevalence (Roth et al., 2022). However, the relationship between Latinxs' acculturative experiences and other important health outcomes, such as comorbidity, remains unexplored.

Comorbidity is of particular concern to the Latinx community. Some physical health conditions (e.g., diabetes) that increase risk of mental disorders disproportionately affect individuals of Latinx descent (Centers for Disease Control and Prevention [CDC], 2019; Schneiderman et al., 2014), making investigation of health comorbidities especially relevant. Individuals with psychiatric disorders have a higher risk of chronic physical illnesses such as diabetes (Grigsby et al., 2002; Musselman et al., 2003) and cardiovascular disease (Goodwin et al., 2016). Common mental (e.g., anxiety, depression) and behavioral (i.e., alcohol/drug use) disorders are also highly comorbid, often referred to as dual diagnoses (Grant et al., 2004; Regier et al., 1990). This is true within the Latinx community, as having a mental disorder increases the risk of developing certain physical conditions, and vice versa (Cabassa et al., 2013). Because US-residing Latinxs often have lower household income and are less likely to be insured (Flores, 2017), the implications of having a health comorbidity can be more serious, exacerbating existing disparities. For example, in addition to being costly (Johnson, 2000) and disabling (Anderson, 2010; Laditka & Laditka, 2016), comorbidities are associated with poorer health outcomes (e.g., hospitalizations, poor functioning, treatment difficulties, and mortality) (Anderson, 2010; Parekh & Barton, 2010; Regier et al., 1990). Risk for multiple disorders also varies by race/ethnicity (Cabassa et al., 2013; Kessler et al., 1994; Smith et al., 2006; Watkins et al., 2015). However, most epidemiologic literature treats the Latinx community as homogenous, despite the aforementioned documentation of Latinx heterogeneity. Alternatively, some Latinx subgroup comorbidity research focuses solely on specific conditions, such as cardiovascular disease (Cabassa et al., 2017; Castañeda et al., 2016; González & Tarraf, 2013). Other studies simply examine psychological distress (Castañeda et al., 2016) rather than psychiatric diagnoses, which are more disabling. Only sparse research has suggested comorbidity may differ by Latinx heritage, nativity, and/or time in the US (Ortega et al., 2000, 2006; Polo et al., 2011; Turner & Gil, 2002; Vega et al., 2003, 2009), some of which use acculturation proxies as a confounder rather than an exposure of interest (Cabassa et al., 2017; Castañeda et al., 2016). Even less has also considered the influence of acculturation, apart from simple proxies, on Latinx mental, physical and/or behavioral health comorbidities (Szaflarski et al., 2017).

Most research focuses on acculturation at an individual level (e.g., English language proficiency or ethnic identity), despite knowledge that a socio-ecological approach is important for understanding health disparities (Alvidrez et al., 2019; Duran & Pérez-Stable, 2019). Latinxs, and in particular immigrants, are adversely impacted by their adaptation to their social environments due to increased exposure to discrimination (Kessler et al., 1999; Psychological Association, 2012) and acculturative stress (Torres, 2010; Torres et al., 2012). These stressors, in turn, negatively affect their physical and mental health (Busse et al., 2017; Torres, 2010; Williams et al., 1997). Additionally, they often reside in underserved communities, which can have adverse impacts on their health and wellbeing (Arcaya et al., 2016; Arévalo et al., 2015). Although these experiences are associated with common acculturation measures, to our knowledge only two studies (Erving, 2017; Szaflarski et al., 2017) have considered Latinx subgroup differences in comorbidity in conjunction with contextual factors such as stress, social support, and/or immigration factors. Erving (2017) found that social factors contributed to the high comorbidity among island-born Puerto Rican men, but were unrelated to the lower prevalence among other Latinxs. Szaflarski et al. (2017) concluded that socioeconomic, cultural, and social factors did not meaningfully impact having a dual diagnosis, regardless of racial-ethnic group. One additional study found acculturative stress to be related to dual diagnosis prevalence (Conway et al., 2007), but the study did not consider additional acculturative factors and only included Puerto Ricans. All studies treated social/contextual factors as independent predictors, ignoring that many of these experiences naturally co-occur.

Utilizing Meyer's (2003) Minority Stress framework, combined with a socio-ecological perspective, can help us understand how minority status produces mental health disparities through several mediating mechanisms. This framework incorporates mediating factors across multiple ecological levels of influence, which include things such as ethnic identity, discrimination, family interactions, community influences, and social support. These factors can be positive or negative, occur together, and interact with one another to produce positive or negative health outcomes. These two models support the idea that acculturation and its related experiences is the complex process through which minority status impacts health. By explicitly applying a socio-ecological perspective, it also accounts for structural factors that produce health disparities when Latinxs interact with their environment on a daily basis. Therefore, it provides concrete targets that researchers, practitioners, and policymakers can address to reduce health disparities in Latinx populations. Thus, in order to address Latinx health disparities, acculturation's impact on comorbidity must be evaluated using a socio-ecological perspective (Bronfenbrenner, 1979), incorporating subgroup heterogeneity. This study simultaneously addresses several limitations of prior research. It explores differences in comorbidity for common physical, mental and behavioral disorders among US-residing Latinxs by important acculturative subgroups by building off of prior work (Roth et al., 2019, 2020). As comorbidity exerts an extra burden on already-taxed, vulnerable individuals, it is important to identify whether certain subpopulations are at higher risk, as well as where resilience resides. To our knowledge, no one has investigated differences in comorbidity among US Latinxs by acculturative experiences subgroups, which include both individual and contextual factors.

This study aimed to 1) estimate the prevalence of comorbid

depressive and anxiety disorders among a sample of Latinxs, overall and by acculturative experiences subgroup (determined via latent class analysis (Roth et al., 2019)); 2) estimate the prevalence of comorbid physical (asthma, diabetes, and cardiovascular disease) and common mental (depressive and anxiety) disorders among Latinxs, overall and by acculturative experience subgroup; 3) estimate the prevalence of comorbid substance use and common mental disorders among Latinxs, overall and by acculturative experience group; and 4) explore the relationship between comorbidity and Latinx ethnic heritage, generational status, and demographic characteristics. Based on the aforementioned literature surrounding acculturation and health, we expect prevalence of all comorbidity categories to differ across the four acculturative subgroups. Additionally, we expect that the subgroup characterized by positive acculturative experiences will exhibit the lowest comorbidity prevalence.

2. Methods

2.1. Study sample

Data come from the National Latino and Asian American Study (NLAAS), one of three nationally-representative, probability-based surveys part of the NIMH-funded Collaborative Psychiatric Epidemiology Surveys (Heeringa et al., 2004; Pennell et al., 2004) conducted in 2001–2003. The target population was non-institutionalized, civilian adults (18+ years) of Latinx or Asian origin in the contiguous US. These groups were oversampled using a stratified, multi-frame probability sampling strategy (Pennell et al., 2004), making the NLAAS the first nationally-representative study powered to examine acculturation and psychiatric disorder among Latinx subgroups. Lay interviewers administered computer-assisted interviews in respondents' homes. The Latinx sample response rate was 75.5% (Heeringa et al., 2004). The present study utilized NLAAS data from 2541 Latinx participants after excluding 13 individuals with unknown generational status. All NLAAS study procedures were approved by the Institutional Review Board (IRB) Committees of Cambridge Health Alliance, the University of Washington, and the University of Michigan (Pennell et al., 2004). Written informed consent was obtained from all participants (Pennell et al., 2004). Additional details regarding the study sample and procedures are found elsewhere (Alegría et al., 2004; Heeringa et al., 2004; Pennell et al., 2004). The present study was approved by the IRB Offices at Washington University in St. Louis (IRB#201810121) and Mercer University (IRB# H2009245).

The overall sample was 19.3% Puerto Rican, 22.7% Cuban, 33.9%, 33.9% Mexican, and 24.1% from other Latinx countries (Table 1). Half of the sample were immigrants arriving to the US as adolescents or adults. The majority of participants were female (55.8%) and married or cohabitating with a partner (62.6%). The mean age was almost 41 years and 38.7% did not complete high school. Almost 20% of the sample met lifetime criteria for a depressive or anxiety disorder, and 9.5% for a substance use disorder. The most common physical disorder was hypertension (19.2%) followed by asthma (11.1%), diabetes (8.8%) and cardiovascular disease (7.1%). Among those with a mental/behavioral comorbidity, 71.1% had a lifetime depressive disorder and 64.5% an anxiety disorder. The mental/physical comorbidity group was similar, with the prevalence of physical illness ranging from 54.8% (hypertension) to 27.8% (cardiovascular disease).

2.2. Measures

All non-diagnostic measures are described elsewhere (Alegría et al., 2004). Questionnaires were adapted, translated into Spanish, and back-translated to ensure cross-cultural equivalency (Alegría et al., 2004), enabling respondents to answer questions in Spanish or English.

Table 1
Sociodemographic characteristics and specific disorder prevalence in overall sample and by comorbidity category (n = 2541).

Characteristic	Overall sample		Depressive/anxiety comorbidity		Mental/behavioral comorbidity		Mental/physical comorbidity	
	n = 2541 (100%)		*n* = 230 (9.1%)		*n* = 121 (4.8%)		*n* = 302 (11.9%)	
Age in years, *mean (sd)*	40.61	15.63	42.04	14.62	38.95	11.51	46.01	16.24
Gender, *N (%)*								
Male	1123	44.2	59	25.7	80	66.1	92	30.5
Female	1418	55.8	171	74.3	41	33.9	210	69.5
Education, *N (%)*								
Less than high school	984	38.7	103	44.8	45	37.2	142	47.0
High school	632	24.9	53	23.0	29	24.0	71	23.5
Any post-secondary	565	22.2	55	23.9	32	26.4	58	19.2
College degree or more	360	14.2	19	8.3	15	12.4	31	10.3
Marital Status, *N (%)*								
Married/cohabitating	1591	62.6	127	55.2	76	62.8	166	55.0
Previously married	477	18.8	67	29.1	22	18.2	89	29.5
Never married	473	18.6	36	15.7	23	19.0	47	15.6
Ethnic Heritage, *N (%)*								
Puerto Rican	490	19.3	54	23.5	39	32.2	88	29.1
Cuban	576	22.7	53	23.0	15	12.4	86	28.5
Mexican	862	33.9	63	27.4	45	37.2	75	24.8
Other Latinx	613	24.1	60	26.1	22	18.2	53	17.5
Generational Status, *N (%)*								
1st Generation	1257	49.5	112	48.7	25	20.7	150	49.7
1.5 Generation	365	14.4	34	14.8	18	14.9	46	15.2
2nd Generation	522	20.5	43	18.7	44	36.4	59	19.5
3rd Generation	397	15.6	41	17.8	34	28.1	47	15.6
Lifetime Disorder								
Depressive Disorder	460	18.1	230	100	86	71.1	197	65.2
Anxiety Disorder	429	16.9	230	100	78	64.5	207	68.5
Substance Use Disorder	241	9.5	–	–	121	100	–	–
Asthma	281	11.1	–	–	–	–	113	37.4
Diabetes	223	8.8	–	–	–	–	86	28.5
Cardiovascular Disease[a]	181	7.1	–	–	–	–	84	27.8
Hypertension	488	19.2	–	–	–	–	165	54.8

Note: DSM = Diagnostic and Statistical Manual; sd = standard deviation.
[a] Heart attack, heart disease, or stroke.

2.3. Comorbidity categories

Lifetime mental and behavioral disorder diagnoses were assessed via a modified version of the World Mental Health Composite International Diagnostic Interview (WHM-CIDI) (Kessler et al., 2004), a structured diagnostic interview. Diagnostic algorithms produced three categories of Diagnostic and Statistical Manual, Fourth Edition (DSM-IV) (Psychiatric Association, 1994) mental and behavioral diagnoses. Mental disorders were limited to any Depressive Disorder (Major Depressive Disorder/Episode, Dysthymia) and any Anxiety Disorder (Post Traumatic Stress Disorder, Generalized Anxiety Disorder, Panic Disorder, Agoraphobia, Social Phobia), as they are both the most common and have the most robust associations with physical health conditions in the literature. Behavioral disorders refer to any Substance Use Disorder (Alcohol Abuse/Dependence, Drug Abuse/Dependence). Lifetime physical health conditions were self-reported (e.g., "Have you ever had a heart attack?" or "Did a doctor or other health professional ever tell you that you had high blood pressure?"). These analyses included physical health conditions highly prevalent in the Latinx population: asthma, diabetes, hypertension, and cardiovascular disease (heart attack, stroke, heart disease) (Ortega et al., 2006).

Three comorbidity categories were considered. Individuals meeting lifetime criteria for both a depressive and anxiety disorder were classified as having comorbid mental (depressive/anxiety) disorders. Those reporting at least one mental disorder (i.e., either anxiety or depression) and meeting criteria for any substance use disorder in their lifetime were classified as having a mental/behavioral health comorbidity. Those reporting at least one mental disorder and one or more physical condition were classified as having a mental/physical health comorbidity. A sensitivity analysis incorporating obesity as an additional physical health condition in the definition of a mental/physical health comorbidity was also conducted, as obesity is a risk factor for many chronic conditions and disproportionately affects the Latinx community (Velasco-Mondragon et al., 2016; Wang et al., 2017) and is also related to nativity, ethnic heritage and acculturation and related experiences (Ai et al., 2018; Velasco-Mondragon et al., 2016; Yeh et al., 2009). Obesity was calculated using Body Mass Index (BMI) of 30.0 or greater.

2.4. Indicators of acculturative experiences

Current acculturation literature encourages using a multidimensional definition of acculturation and the context of reception from a socio-ecological perspective (Bronfenbrenner, 1979; Schwartz et al., 2010). Thus, five scales were selected to represent the latent construct of acculturative experiences. Scales were either measures of acculturation or enculturation, or related acculturative experiences across different ecological levels with known associations with health and acculturation in the literature. Using exploratory factor analysis in an exploratory structural equation modeling framework, prior research Roth et al. (2020) generated factor scores after accounting for measurement invariance by generational status. The resulting nine factors, described below, are indicators of acculturative experiences in the latent profile analysis, detailed below. Scales can be reviewed in full in Online Supplementary Material 1.

Language. Measured by two correlated factors (English; Spanish) from the Language Proficiency and Preference scales (six items) (Felix-Ortiz et al., 1994). Higher scores on both English and Spanish factors indicate greater use/preference of each language.

Ethnic Identity. One factor, derived from the four-item Ethnic Identity scale (Guarnaccia et al., 2007), measures the degree to which individuals feel connected to others from the same country of origin (Phinney, 1990). Higher scores indicate increased identification with one's racial/ethnic group.

Neighborhood Context. Measured by two correlated neighborhood factors (Cohesion and Danger) derived from the four-item Neighborhood Social Cohesion and three-item Neighborhood Safety Scales (Bearman et al., 1997; National Institute of Mental Health and Administration, 1994; Sampson et al., 1997). Higher scores indicate greater perceived neighborhood cohesiveness and dangerousness, respectively.

Family Context. Two correlated family factors (Cohesion and Conflict) were derived from a 15-item scale (Cervantes et al., 1991; Olson, 1986; Olson et al., 1989). Higher scores indicate increased familial respect/closeness and increased familial cultural conflict, respectively.

Discrimination. Two correlated discrimination factors (Observed and Perceived) were derived from the nine-item Everyday Discrimination scale (Jackson et al., 1995; Williams et al., 1997), and three items adapted from Vega and colleagues (Vega et al., 1993). Higher scores indicate greater discrimination, either observed in daily life (e.g., harassment) or perceived as attributable to race/ethnicity.

From a socio-ecological perspective, measures of language and ethnic identity are situated within the individual level, whereas family context, neighborhood context, and discrimination are measures of "meso" levels of influence (i.e., relationship and community).

2.5. Latent Profiles of Latinxs' acculturative experiences

Participants were classified into similar subgroups ("profiles") using Latent Profile Analysis (LPA) using an expectation-maximum algorithm. LPA groups similar individuals into unobserved "profiles" based on a set of observed indicators (Gibson, 1959; Goodman, 1974; Lazarsfeld & Henry, 1968), thus capturing underlying population heterogeneity (Gibson, 1959; Lanza & Rhoades, 2013; Masyn and Little, 2013; Nylund et al., 2007), capable of identifying meaningful at-risk or resilient subpopulations. Individuals are assigned a probability of membership in each profile, helping account for measurement error. Correlations were allowed between factors within scales (e.g., family cohesion and conflict). Profile enumeration and selection was guided by fit statistics (log likelihood, Akaike's Information Criteria, Bayesian Information Criteria, Lo-Mendell-Rubin Likelihood Ratio Test), smallest profile size, and substantive interpretation. High entropy (0.966) confirmed that individuals could be classified into their most likely profile with high confidence (Clark & Muthén, 2009).

This work Roth et al. (2019) identified four latent profiles of Latinxs in the NLAAS based on nine factor scores described above. Profiles were primarily distinguished by contextual factors, namely family context, neighborhood context, and discrimination: 1) Positive Experiences (69% of the sample), 2) Cohesive-Conflict (17%), 3) Marginalized-Conflict (9%), and 4) Marginalized (5%). The methods and sample characteristics are available elsewhere (Roth et al., 2019, 2020). Briefly, Latinxs in the Positive Experiences profile reported the highest levels of ethnic identity, neighborhood cohesion, and safety and the lowest discrimination and family conflict (Roth et al., 2019). The Cohesive-Conflict profile experienced similarly high cohesion but perceived their neighborhoods as less safe; they also reported the highest family conflict and discrimination. Those in the Marginalized-Conflict profile had similarly-elevated levels of discrimination and conflict, but lower cohesion. The Marginalized profile had the lowest cohesion combined with moderate discrimination and conflict. There were no differences in English language proficiency and preference across profiles. See Online Supplementary Material 2 for a figure displaying mean factor scores by most probable profile membership (the profile an individual is most likely to belong to).

2.6. Covariates

Sociodemographics included age at interview, sex, education (less than high school, high school, some college, and college degree), and marital status (married/cohabitating, previously married [i.e., divorced/separated/widowed], and never married). Self-reported ethnic heritage was categorized into four subgroups: Puerto Ricans, Mexicans, Cubans and All Others. Four generational status categories were created: first generation (arriving in the US at age 13 or older), 1.5

generation (arriving when less than age 13), second generation (US-born with 1+ parent foreign-born) and third generation (US-born, both parents US-born). For Puerto Ricans, island-born individuals were considered foreign-born, versus US mainland-born. Separating the first and 1.5 generations is important from a developmental perspective, because it allows for differences by age of migration to the US, which is often associated with disorder prevalence (Alegría et al., 2007b; Vega et al., 2004).

2.7. Statistical analysis

Lifetime comorbidity categories were included as distal outcomes into the structural model identified in previous work Roth et al. (2019) using the BCH method (Asparouhov & Muthén, 2014; Bolck et al., 2004), which uses weights to prevent profile shifting when including auxiliary variables in the model, thus incorporating the uncertainty (i.e., measurement error) associated with classifying individuals into each profile. This approach can also accommodate incorporating direct effects from predictors (e.g., heritage) to the outcome, relaxing the assumption that profile membership fully mediates the relationship between predictors and outcome.

We assessed differences in the prevalence of each outcome across the four acculturative profiles using Wald tests and pairwise z-tests. Associations between outcomes and latent profiles is controlled for by the influence of all covariates. Online Supplementary Material 3 contains a path diagram of the final model. A sensitivity analysis for mental/physical comorbidity was undertaken to assess whether the inclusion of obesity as a physical health condition altered any conclusions. Analyses were performed in Mplus Version 8 (Muthén & Muthén, 1998). RStudio (RStudio Team, 2015) and the MplusAutomation package (Hallquist & Wiley, 2018) were utilized for data management and graphics. Statistical significance was assessed at the 0.05 level.

3. Results

Several sociodemographic characteristics were different across comorbidity categories in our sample (Table 1). Individuals with comorbid mental/physical disorders were older ($mean_{age} = 46.01$) and those with a mental/behavioral comorbidity were younger ($mean_{age} = 38.95$). Those with comorbid anxiety/depression had the highest percentage of females (74.3%) and those with a mental and behavioral disorder the lowest (33.9%). This comorbidity category had the most married participants (62.8%). Puerto Ricans and Mexicans were over-represented among individuals exhibiting mental/behavioral comorbidity (32.2% and 37.2%, respectively). Approximately half of individuals with mental (i.e., depressive/anxiety; 48.7%) or mental/physical (49.7%) comorbidity were first-generation adult immigrants, compared with only 20.7% of those with a mental/behavioral comorbidity. Among Latinxs with comorbid mental/behavioral disorders, the most were second generation (36.4%), followed by third generation (28.1%).

Direct effects of sociodemographics on each comorbidity category and are displayed in Table 2. After controlling for acculturative experiences, age increased the likelihood of mental/physical comorbidity (OR = 1.02; 95% CI:1.01–1.03). Females were more likely to have a depressive/anxiety (OR = 2.33; 95% CI:1.71–3.16) or mental/physical comorbidity (OR = 1.87; 95% CI:1.44–2.44) but 64% less likely to have mental/behavioral comorbidity (95% CI:0.24–0.53), compared to males. Odds of depressive/anxiety and mental/physical comorbidity decreased with higher educational attainment (having at least a college degree compared with less than high school $OR_{dep/anx} = 0.43$; 95% CI:0.25–0.72 and $OR_{ment/phys} = 0.52$; 95% CI:0.34–0.80). Being divorced, separated or widowed was only related to mental comorbidity (OR = 1.44, 95% CI:1.02–2.04).

After adjusting for acculturative experiences, Mexicans were less likely to have a mental (OR = 0.64; 95% CI:0.43–0.95) or mental/physical comorbidity (OR = 0.47; 95% CI:0.33–0.67), compared to

Table 2
Direct effects of covariates on comorbidity types adjusted for latent profile membership of acculturative experiences.

Effect	Depressive/anxiety comorbidity			Mental/behavioral comorbidity			Mental/physical comorbidity		
	n = 230 (9.1%)			*n* = 121 (4.8%)			*n* = 302 (11.9%)		
	OR	95% CI *(LL-UL)*	*p*	OR	95% CI *(LL-UL)*	*p*	OR	95% CI *(LL-UL)*	*p*
Age in years	1.00	(0.99–1.01)	0.831	1.01	(0.99–1.02)	0.454	**1.02**	**(1.01–1.03)**	**<0.001**
Sex									
Male	REF	–	–	REF	–	–	REF	–	–
Female	**2.33**	**(1.71–3.16)**	**<0.001**	**0.36**	**(0.24–0.53)**	**<0.001**	**1.87**	**(1.44–2.44)**	**<0.001**
Education									
Less than high school	REF	–	–	REF	–	–	REF	–	–
High school	0.73	(0.50–1.05)	0.086	0.70	(0.43–1.14)	0.154	0.77	(0.56–1.06)	0.108
Any post-secondary	0.84	(0.59–1.21)	0.349	0.88	(0.54–1.42)	0.594	**0.69**	**(0.49–0.98)**	**0.036**
College degree or more	**0.43**	**(0.25–0.72)**	**0.002**	0.71	(0.39–1.31)	0.278	**0.52**	**(0.34–0.80)**	**0.003**
Marital Status									
Married/cohabitating	REF	–	–	REF	–	–	REF	–	–
Previously married	**1.44**	**(1.02–2.04)**	**0.039**	0.98	(0.58–1.66)	0.929	1.23	(0.90–1.69)	0.188
Never married	0.78	(0.52–1.16)	0.219	0.69	(0.41–1.16)	0.165	0.97	(0.67–1.40)	0.874
Ethnic Heritage									
Puerto Rican	REF	–	–	REF	–	–	REF	–	–
Cuban	1.00	(0.65–1.52)	0.987	0.57	(0.29–1.11)	0.099	0.85	(0.59–1.22)	0.380
Mexican	**0.64**	**(0.43–0.95)**	**0.027**	0.76	(0.49–1.20)	0.243	**0.47**	**(0.33–0.67)**	**<0.001**
Other Latinx	0.91	(0.61–1.36)	0.650	0.67	(0.39–1.15)	0.146	**0.48**	**(0.33–0.70)**	**<0.001**
Generation									
1st Generation	REF	–	–	REF	–	–	REF	–	–
1.5 Generation	1.10	(0.72–1.67)	0.674	**2.58**	**(1.41–4.72)**	**0.002**	1.34	(0.92–1.93)	0.125
2nd Generation	1.01	(0.68–1.50)	0.979	**4.50**	**(2.65–7.63)**	**<0.001**	1.23	(0.86–1.76)	0.249
3rd Generation	1.25	(0.83–1.88)	0.280	**4.12**	**(2.32–7.34)**	**<0.001**	1.26	(0.86–1.85)	0.228

Note. Data are from the National Latino and Asian American Study ($N = 2541$). All models are adjusted for acculturative experiences profile. OR = odds ratio; CI = confidence interval; LL = lower limit; UL = upper limit; REF = reference category. Estimates in **bold** are significant at the $p < 0.05$ level.

Puerto Ricans. Other Latinxs were similarly less likely to have a co-occurring mental/physical condition (OR = 0.48; 95% CI:0.33–0.70). Generational status was unrelated to depressive/anxiety or mental/physical comorbidity. However, strong nativity differences were seen for mental/behavioral comorbidity. Compared to first-generation immigrants, Latinxs migrating as children had 2.58 times higher odds of mental/behavioral comorbidity (95% CI:1.41–4.72) and US-born Latinxs had a four-fold increase ($OR_{second\text{-}gen} = 4.50$; $OR_{third\text{-}gen} = 4.12$).

Comorbidity prevalence across acculturative profiles is displayed in Fig. 1. Wald tests revealed significant within-category differences after controlling for sociodemographics ($\chi^2_{depressive/anxiety} = 31.476$, $\chi^2_{mental/behavioral} = 18.541$, $\chi^2_{mental/physical} = 16.775$, [all $p < 0.001$]; Table 3). Individuals in the Positive Experiences profile have the lowest probability of all comorbidity types, ranging from 0.034 with a mental/behavioral comorbidity to 0.099 with a mental/physical comorbidity. The remaining three profiles exhibited a similar pattern for psychiatric comorbidities. The Marginalized Conflict profile had the highest proportion of depressive/anxiety and mental/behavioral comorbidity (0.181 and 0.117, respectively). However, a distinct pattern is observed for mental/physical comorbidity. Although the Marginalized profile had moderate proportion of mental and mental/behavioral comorbidity (0.099 and 0.056, respectively), they had the highest mental/physical comorbidity proportion (0.176). This was similar to the Cohesive-Conflict and Marginalized Conflict subgroups (0.159 and 0.157, respectively), all significantly higher than the Positive Experiences profile ($p < 0.05$).

Results from the sensitivity analysis (found in Online Supplementary Material [OSM] 4) showed that conclusions did not changed after including obesity as a physical health condition in the outcome. With this addition, n = 74 additional Latinxs were included in the mental/physical comorbidity category (OSM 4, Supplementary Table 1). Broadly, direct effects were similar (OSM 4, Supplementary Table 2). The pattern of comorbidity prevalence across latent acculturative profiles (OSM 4, Supplementary Table 3) was also similar, although prevalence among the Cohesive-Conflict and Marginalized Conflict groups was slightly increased.

4. Discussion

Nearly one fifth of our sample had some type of health comorbidity, with mental/behavioral comorbidity being the least prevalent and mental/physical comorbidity the most. The prevalence of individual psychiatric diagnoses in our sample was comparable to other nationally-representative Latinx samples (Karno et al., 1987; Kessler et al., 1994; Vega et al., 1998). Compared with temporally-appropriate estimates from the National Health Interview Survey, physical health conditions varied slightly: whereas hypertension and diabetes were comparable (Pabon-Nau et al., 2010), asthma prevalence was higher (11.1% vs. 5.8%). Although more recent, cardiovascular disease estimates from American Heart Association data are also similar (Balfour et al., 2016).

Compared to prior literature, our study explored Latinxs' acculturative experiences in the US, including both individual and contextual factors (e.g., neighborhood and family environment). To our knowledge, this is the first study to do so using latent variable methods. Latinxs in our sample were distinguished primarily by these contextual experiences, underscoring the need to use a socio-ecological approach combined with the Minority Stress framework to understand how acculturative processes produce health outcomes in the Latinx community (Bronfenbrenner, 1979; Meyer, 2003). Other studies have also noted that Latinx and immigrant mental health is impacted by their

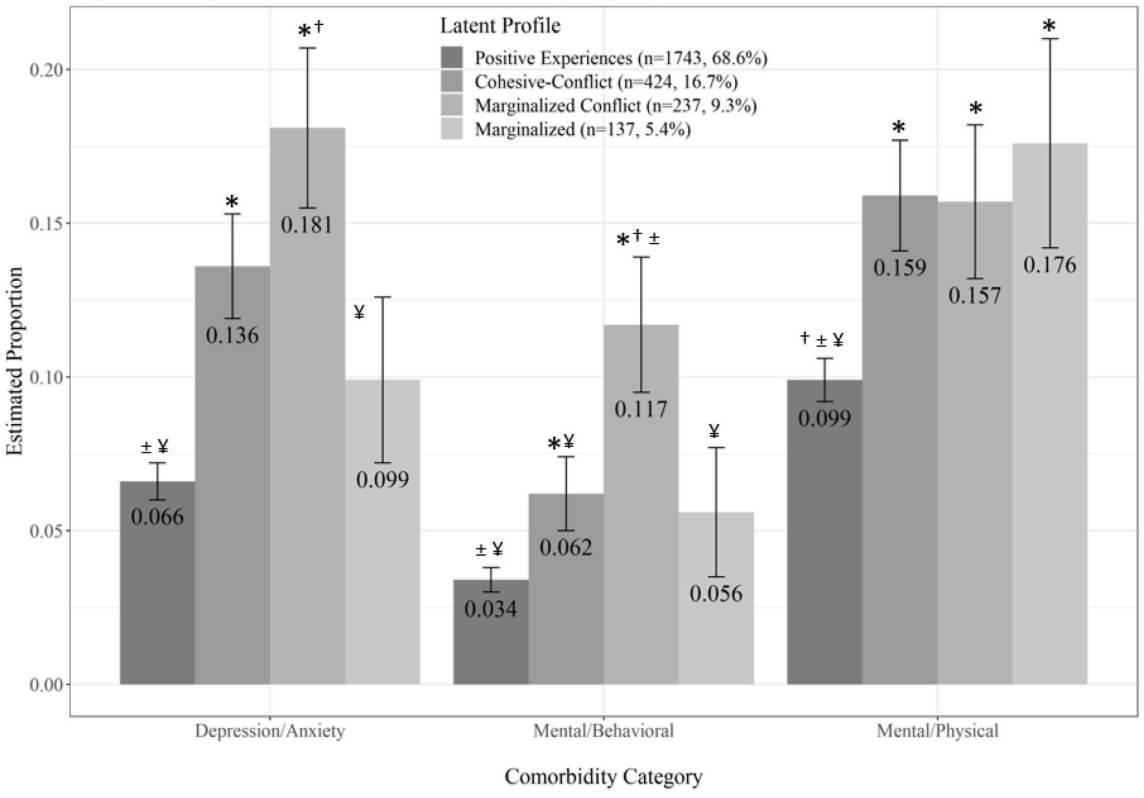

Fig. 1. Proportion with Lifetime Comorbidity Type by Latent Profile
Note. Error bars indicate standard error of estimates. Data are from the National Latino and Asian American Study ($N = 2541$).
* Significantly different from Positive Experiences profile;
† Significantly different from Marginalized profile;
± Significantly different from Cohesive-Conflict profile;
¥ Significantly different from Marginalized Conflict profile.

Table 3
Prevalence of comorbidity types across four latent profiles of acculturative experiences in adjusted analysis.

	Proportion	*SE*	Wald test	Significant pairwise comparisons	Difference in proportions	*SE*	p
Comorbid depressive/anxiety disorders			$\chi^2 = 31.476$ p < 0.0001*				
Overall sample	0.091	–		Positive vs. Cohesive-Conflict	−0.070	0.018	<0.001
Positive Experiences	0.066	0.006		Positive vs. Marginalized Conflict	−0.116	0.027	<0.001
Cohesive-Conflict	0.136	0.017		Marginalized vs. Marginalized Conflict	−0.083	0.039	0.033
Marginalized Conflict	0.181	0.026					
Marginalized	0.099	0.027					
Comorbid mental/behavioral disorders			$\chi^2 = 18.541$ p = 0.0003*				
Overall sample	0.048	–		Positive vs. Cohesive-Conflict	−0.028	0.013	0.028
Positive Experiences	0.034	0.004		Positive vs. Marginalized Conflict	−0.083	0.022	<0.001
Cohesive-Conflict	0.062	0.012		Marginalized Conflict vs. Cohesive-Conflict	0.055	0.025	0.026
Marginalized Conflict	0.117	0.022		Marginalized vs. Marginalized Conflict	−0.061	0.031	0.049
Marginalized	0.056	0.021					
Comorbid mental/physical disorders			$\chi^2 = 16.775$ p = 0.0008*				
Overall sample	0.119	–		Positive vs. Cohesive-Conflict	−0.060	0.020	0.002
Positive Experiences	0.099	0.007		Positive vs. Marginalized Conflict	−0.058	0.026	0.026
Cohesive-Conflict	0.159	0.018		Positive vs. Marginalized	−0.077	0.035	0.027
Marginalized Conflict	0.157	0.025					
Marginalized	0.176	0.034					

Note. Data are from the National Latino and Asian American Study (n = 2541). All estimates are adjusted for direct effects of sex, age, education, marital status, ethnic heritage and generational status. S.E. = Standard Error. *Wald test has three degrees of freedom.

socioeconomic, cultural and psychosocial contexts, coupled with life events (Alegría et al., 2004; Boen & Hummer, 2019; Szaflarski et al., 2017). Erving (2017) even argues that comorbidity is classified as a "marker of social disadvantage." Our findings reinforce that negative experiences are associated with decreased mental and physical well-being, as the Positive Experiences profile had the lowest probability of all comorbidity categories. In comparison, all other classes with different types and levels of negative experiences had increased co-morbidity prevalence. While unsurprising, it lends additional validity to the latent profile construct in our sample. The Positive Experiences profile also stood out with the highest identification with one's own cultural group. This highlights that such subgroups can benefit from Latinx ethnic identity as a protective factor in supporting health and wellbeing (Ai et al., 2014; Balidemaj & Small, 2019), as well as its ability to serve as a buffer in the face of negative experiences such as discrimination (Ai et al., 2014; Brown, 2020). Our findings provide support for it as an important mediator in the Minority Stress framework.

Importantly, this study uncovered distinct patterns of comorbidity across acculturative profiles, depending on comorbidity type. These findings reinforce the notion that the immigrant health paradox holds for some health conditions but not others, as there was only a strong association with generational status for mental/behavioral comorbidity. The decreased prevalence of comorbid depression/anxiety and mental/behavioral disorders among the Cohesive-Conflict profile as compared to the Marginalized Conflict profile (both characterized by high conflict/discrimination but differentiated by levels of social cohesion) suggests the high burden of psychiatric comorbidities may be lessened through increasing low-cohesion group members' access to social support. Chronic stress may predict comorbidity, especially drug use and mental disorders (Volkow et al., 2004). Groups with greater social support may be buffered in the presence of contextual-level stressors, particularly against substance use issues. As posited by the Minority Stress framework (Meyer, 2003), social support, operationalized in the present study as family and neighborhood cohesion, can be a coping mechanism that moderates (and in this case lessens) the impact that stressors have on health. Whether this is through stress reduction or the absence of self-medication, bolstering social support at the family and community level may be an effective way to lessen negative mental and behavioral health sequelae resulting from negative acculturative experiences that Latinxs encounter.

In contrast, support for a possible buffering effect was not seen for comorbid mental/physical conditions. That is, comorbidity prevalence was similarly elevated among the Cohesive-Conflict and Marginalized Conflict profiles despite their differing levels of cohesion. Thus, the development of a comorbid physical health condition may operate along different pathways that cannot be buffered by social support. Indeed, literature on chronic stress suggests that the body can internalize unrelenting, negative experiences, resulting in physical illness (Gallo et al., 2014; Jackson et al., 2010). Allostatic load, described as stress-induced "wear and tear" on the body (McEwen & Stellar, 1993), provides a rationale for how this process might operate and has been linked to individual-level sociodemographic characteristics, contextual influences, and adverse health outcomes (Guidi et al., 2021).

Interestingly, the Marginalized profile had the highest prevalence of mental/physical comorbidity, despite the lower levels of discrimination, family conflict, and neighborhood danger. This may suggest that even small amounts of adverse negative acculturative experiences trigger internal biologic processes that results in illness. Conversely, the isolation of navigating US culture as a minority and/or immigrant may exert just as much bodily "wear and tear" as more blatant stressful experiences (e.g., intergenerational conflict). Although more research is needed, this finding has two implications. First, to prevent mental/physical comorbidity, structural drivers of chronic stress among US-residing Latinxs must be addressed; that is, increasing social support in the presence of high levels of discrimination, conflict, and unsafe neighborhoods is not enough to improve health among high-risk groups. Second, more attention must be given to immigrants and minorities who find themselves cut off from others. Marginalized individuals may not always report experiencing traditional acculturative stressors (e.g., discrimination or family conflict), but the mental/physical comorbidity burden they bear is high. This is especially important as these individuals are often "hidden" and may not have the support to navigate the US healthcare system to receive treatment. Therefore, identifying individuals experiencing marginalization and getting them into appropriate care should be a priority.

4.1. Constraints on generality

This study has several limitations. The NLAAS data is self-report and

therefore subject to bias. As it is cross-sectional, no causal statements can be made. Participants with a health comorbidity may be more likely to recall stressors due to their illness, biasing the results. Further, reciprocal processes may be operating, where the increased burden of comorbidity leads to more stressors (e.g., family conflict). Sample size issues limited our ability to disaggregate Central and South Americans, who have distinct characteristics and reasons for migration. This research should be replicated in studies powered to examine differences between these groups. Replication of our findings in other samples will also add additional validity to our latent construct. We focused here on only the most common mental disorders, but future research should investigate mental and physical comorbidities for other psychiatric conditions. The NLAAS data are approximately 20 years old. The contextual and acculturative issues facing US-residing Latinxs and immigrants have changed, such as increased discrimination on a national level (Pew Research Center, 2018) or different reasons for migrating (Durand & Massey, 2010), calling into question the generalizability of our findings to current day. However, many things remain the same, such as the ability of intergenerational cultural conflict within families to impact Latinx wellbeing (Dennis et al., 2010; Toro & Farver, 2020) or how stress and discrimination are internalized within the body (Cuevas et al., 2019; Sirin et al., 2015). These similarities lend confidence in the ability to apply our findings to today. Finally, our latent construct relied more heavily on contextual indicators of acculturation over individual-level indicators (e.g., language and ethnic identity), and this may have influenced our finding that individual-level variables were less salient. Future studies should expand collection of acculturation measures in accordance with expert recommendation (e.g., see Schwartz et al., 2010). Future studies should also explore the impact of this novel acculturation conceptualization in a more contemporary sample, using sampling weights to garner national estimates.

5. Conclusion

The NLAAS is the largest nationally-representative study of US-residing Latinxs with rich data on acculturation, acculturative experiences, and health, allowing disaggregation by important Latinx subgroups that are often ignored. This is the first study to use a latent variable approach to examine the association of individual- and contextual-level acculturative experiences with several health comorbidities. It uncovered distinct patterns of comorbidity, suggesting there may be different mechanistic pathways operating for different health conditions. Attention should also be given to communities and individuals experiencing marginalization, regardless of the stressors they encounter. Identifying vulnerable subgroups of Latinxs will enable health professionals to increase delivery of services to at-risk individuals and improve their health and quality of life.

CRediT author statement

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Declaration of competing interest

None.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ssmph.2022.101179.

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