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Exposure to American culture is associated with Premenstrual Dysphoric Disorder among ethnic minority women

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Abstract

Background—Ethnic minorities in America will achieve majority by 2042, and due to their younger age distribution, will represent the largest proportion of women at risk for Premenstrual Dysphoric Disorder (PMDD). Research has not addressed ethnic minority women's vulnerabilities to PMDD. The objective of this study was to examine the relationship between acculturation and PMDD.

Methods—An analysis of acculturation and PMDD among 3,856 English-speaking, pre-menopausal Asian, Latina, and Black women from the National Latino and Asian American Survey and the National Survey of American Life.

Results—The lifetime prevalence of PMDD was 3.3%. Nativity status, duration of residence, and age at immigration were significantly associated with PMDD. Foreign-born women (OR=0.38; 95% Confidence Interval (CI)=0.21–0.68) and immigrants arriving to the US after age six (OR=0.33, 95% CI=0.18, 0.62) were less likely to have PMDD, compared to US-born women, and US-born women/immigrants who arrived before age six, respectively. The likelihood of PMDD increased as the duration of residence in the US lengthened.

Limitations—The diagnosis of PMDD was provisional due to retrospective symptom reporting. Statements of causality could not be made because the study was cross-sectional.

Conclusions—A substantial percentage of ethnic minority women suffer from PMDD in their lifetimes. Exposure to American culture appeared to elevate ethnic minority women's likelihood for PMDD. The stressors that are associated with ethnic minority life in America—discrimination, poverty, pressures to assimilate, etc.—may contribute to ethnic minority women's vulnerability to PMDD, and clinicians should be sensitive to the special risks in this population.

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Author roles

C. Pilver conducted the data analyses and prepared the first draft of the manuscript. B. Levy reviewed the initial drafts of the manuscript and prepared feedback. S. Kasl and R. Desai contributed to later drafts of the manuscript. All authors contributed to and have approved the final manuscript.

Disclosures

The authors have no competing interests.

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Keywords

Premenstrual Dysphoric Disorder; acculturation; ethnic minority women

Introduction

Premenstrual Dysphoric Disorder (PMDD) is a psychiatric disorder characterized by depressed mood, anxiety, irritability, and mood swings occurring in a cyclical pattern in the week prior to the onset of menses (Association, 2000). PMDD affects approximately 3–8% of American women of reproductive age (Halbreich et al., 2003). Knowledge of the correlates and causes of PMDD is limited and inconclusive, particularly among ethnic minority immigrants and US-born ethnic minority women. According to US Census estimates, ethnic minorities comprise one third of the US population today, and are projected to become the majority in 2042 (Bernstein and Edwards, 2008). Furthermore, 82% of the increase in the US population expected between 2005 and 2050 will be due to immigrants and their descendants (Passel and Cohn, 2008), and a greater percentage of immigrants are of reproductive age (and thus at risk for PMDD), compared to US-born women (Larsen, 2004). Given these trends, the majority of American women suffering from PMDD will be non-white, and immigrants or the children of immigrants in the near future. Consequently, the Office for Women's Health Research has listed the examination of PMDD among ethnic minority women as a research priority (U.S. Department of Health and Human Services, 1999).

We applied an acculturation model to examine patterns in the prevalence of PMDD among ethnic minority women. Acculturation is the process by which individuals acquire the norms and values that are dominant in a society (Lara et al., 2005). This model has been proposed to explain patterns observed in the psychopathology of foreign and US-born ethnic minority populations. The acculturation model highlights the role of culturally-specific protective factors, socialization experiences, and the adoption of American cultural values in development of psychiatric illness.

Ethnic minority immigrants are far less likely than their US-born counterparts to develop mood, anxiety, and substance use disorders over their lifetimes (Escobar et al., 2000; Takeuchi et al., 2007; Vega et al., 1998; Vega et al., 2004; Williams et al., 2007). Some researchers have argued that immigrants' health advantage is due to a selection bias known as the "healthy immigrant hypothesis." According to this theory, immigrants are younger, better educated, and healthier compared to persons who stay behind; these factors favor immigrants' adjustment to their host country. Consequently, immigrants represent a non-random sample of healthier than average individuals, and thus have lower rates of medical and physical illness in comparison to ethnic minorities born in the US. This phenomenon may partially explain the physical and mental health advantage observed among immigrants (Escobar et al., 2000; Vega et al., 1998; Vega et al., 2004), although evidence in support of this theory is mixed.

Researchers have also suggested that foreign-born ethnic minorities have a mental health advantage over US-born ethnic minorities that is attributable to certain protective factors engendered by immigrants' attachment to their country and culture of origin. Research links these culturally-specific protective factors, namely strong social support networks, family cohesion, and religiosity, to positive mental health outcomes among minority populations (Levin et al., 1995; Mulvaney-Day et al., 2007; Zhang and Ta, 2009). However, the culturally-specific protective factors that contribute to immigrants' mental health advantage are degraded over time, and rates of psychopathology converge to those of the US-born

(Breslau et al., 2007). For example, intergenerational conflict and family discord is commonly observed as immigrants and their native-born children gain greater exposure to American cultural norms that are in opposition to the values of their country of origin. Furthermore, immigrants may face greater racial and ethnic discrimination through their attempts to assimilate into majority culture and growing contact with non-immigrants. Other aspects of acculturative stress, such as the challenge of maintaining a bicultural identity, language difficulties, and coping with the dissolution of ties to family remaining in one's country of origin, may also elevate immigrants' susceptibility to mental illness.

In support of these explanations, several studies have shown that that risk for psychopathology is positively associated with immigrants' length of residence in the United States (Alegria et al., 2006; Alegria et al., 2007b; Breslau et al., 2007). In a study of Latinos, Alegria et al. (Alegria et al., 2007) found the likelihood of any lifetime psychiatric disorder (depressive, anxiety, and substance abuse) increased in a dose-response fashion as duration of residence in the United States increased, with US-born Latinos having the greatest likelihood for psychopathology. In separate studies this dose-response pattern was observed in relation to lifetime risk for anxiety disorders among Asian American (Takeuchi et al., 2007) and Black (Williams et al., 2007) women.

Evidence from the acculturation model indicates that the developmental timing of exposure (the degree of contact with American culture) may contribute to immigrants' risk for psychopathology. The developmental timing of exposure is operationalized as the age at which immigrants first arrived in the US. A number of studies have shown that immigrants that spend their childhood in Asia, Central or South America, and Africa or the Caribbean, are at much lower risk for psychiatric disorders, including depression, anxiety, and substance abuse, compared to US-born Asians, Latino/as, and Blacks, respectively (Breslau et al., 2007; Breslau et al., 2009; Breslau and Chang, 2006; Takeuchi et al., 2007). In contrast, immigrants that spend their childhood in the US demonstrate elevated risk for psychopathology that is comparable to US-born ethnic minorities (Alegria et al., 2007a; Breslau et al., 2007; Vega et al., 2004).

In considering the developmental phenomena that determine children's exposure experience and may explain these patterns, Suarez-Orozco and Suarez-Orozco (Suarez-Orozco and Suarez-Orzoco, 2001) identify age six as a critical year. At age six, children in the United States begin formal schooling. Although exposure to native culture and traditional values is predominant in the years preceding entry into the school system, US-born children and children who immigrate before age six are inundated with acculturating forces through schooling and interaction with peers after age six (Suarez-Orozco and Suarez-Orzoco, 2001). In contrast, later arriving immigrants encounter these acculturating influences at later ages, following socialization experiences in their country of origin that anchor them to native cultural values and practices. Recognizing that US-born children and immigrants who arrive in early childhood (before age 6) have essentially the same exposure experiences, Alegria and colleagues (Alegria et al., 2007a) argue that these groups can be combined into a single category of exposure, "in-US-as-child". Persons arriving after age 6 have a different exposure experience, and are characterized as "later-arrival-immigrants." Using these definitions of exposure, Alegria and colleagues (Alegria et al., 2007a) found that later-arrival-immigrant Mexicans were significantly less likely to have a depressive disorder in their lifetimes compared to in-US-as-child Mexicans.

In the context of research on PMDD, the acculturation model suggests two broad pathways that may contribute to the development of the disorder. The first pathway is through stress. Several studies have shown that women reporting premenstrual symptoms or PMDD also report greater life stresses (Fontana and Palfai, 1994; Warner and Bancroft, 1990; Woods et

al., 1985) and poorer methods of coping with stress (Ornitz and Brown, 1993). In the absence of culturally specific factors such as family cohesion and extended social support networks, individuals may experience their lives as more stressful and thus be more vulnerable to PMDD. Discrimination, which is a chronic stressor particularly salient for immigrants, is also positively associated with PMDD among ethnic minorities (Pilver et al., in preparation). Other aspects of acculturative stress, such as language difficulties, may also contribute to immigrants' unique vulnerability to PMDD.

The second pathway is through cultural variations in attitudes toward menstruation. In America menstruation is viewed rather negatively and is highly medicalized. American women are bombarded with messages about premenstrual symptoms and PMDD, from an industry of "products, pills, and prescriptions" geared to alleviate these symptoms (Figert, 2005). Exposure to the medicalization of premenstrual symptoms, the pervasiveness of pharmaceutical products for the alleviation of premenstrual symptoms and PMDD, and the belief that premenstrual symptoms are unusual and intolerable, may negatively influence the perception of premenstrual experiences among immigrants and US-born ethnic minority women. In line with this argument, a study demonstrated that women exposed to negative beliefs about premenstrual symptoms reported more severe symptoms at follow up, compared to women exposed to a neutral condition (Marván and Escobedo). Thus, greater acculturation and adoption of American attitudes, exposure to these attitudes from an early age, and the loss of (more positive) traditional beliefs related to menstruation may contribute to elevated rates of PMDD among immigrants who are long-term residents of the US and immigrants who arrived in early childhood, in contrast to US-born ethnic minorities.

In this analysis, we applied the acculturation model to the study of PMDD among immigrant and US-born ethnic minority women for the first time. On the basis of prior evidence from research on other psychiatric disorders, we hypothesized the following:

1. Compared to US-born ethnic minorities, foreign-born ethnic minorities would be significantly less likely to have PMDD.
2. Duration of residence would be positively associated with PMDD, with US-born ethnic minorities demonstrating the greatest likelihood for PMDD.
3. Late-arrival immigrants (women who immigrate to the US after age six) would be significantly less likely than in-US-as-child women (US born or immigrated before age 6) to have PMDD.

Methods

These data came from two recently conducted cross-sectional surveys, the National Latino and Asian American Survey (NLAAS) (Alegria et al., 2004), and the National Survey of American Life (NSAL) (Jackson et al., 2004). These projects were funded by the National Institute of Mental Health, and utilized the same core survey instrument, the World Mental Health Composite International Diagnostic Interview (WMH-CIDI), version 3.0. Data from the NLAAS and NSAL may be analyzed individually or as a single large sample population (Heeringa and Berglund, 2007).

Respondents were selected for inclusion in each survey through a multi-stage probability sampling strategy to achieve nationally representative samples and adequate numbers of racial/ethnic minorities. The surveys included English-speaking, non-institutionalized adults (age 18 or older). Although English language proficiency was a requirement for inclusion for the NSAL, NLAAS participants were given the option to complete the survey in English, Spanish, Mandarin, Cantonese, Tagalog, and Vietnamese. Interviews were conducted from 2001–2003 and response rates ranged from 71%–81% (Pennell et al., 2004).

Our inclusion criteria were: 1) completed the PMDD module; 2) self-reported Asian, Latino, or Black race/ethnicity; 3) premenopausal status and 4) information reported on immigration related factors. From 6,320 female participants in the NLAAS and NSAL, we excluded 519 non-Latina white women, 201 ethnic minority women who randomly did not complete the PMDD module to reduce study costs, 1,734 post-menopausal women, and 10 women who did not indicate their menopausal status. Thus, our final sample included 3,856 female participants.

Table 1 presents the demographic characteristics of our sample. The weighted lifetime prevalence of PMDD was 3.3% (SE=0.40). Our sample was primarily composed of Latina (42.2%) and Black (40.8%) women with a smaller percentage of Asian women (17.0%). Most participants were born in the United States (59.7%), were employed (57.9%), had at least a high school education (73%), were nonsmokers (74%), had used oral contraceptives (64.7%), and were in good physical (mean=3.4) and mental health (mean=3.81). Only 3.3% of the sample had a DSM-IV diagnosed mood disorder in the month prior to the interview. The average age of the participants in the sample was 32.7 years, with a mean age at menarche of 12.7 years. The average participant had an income well above poverty (mean=4.1).

Measures

The WMH-CIDI was adapted by the World Mental Health (WMH) Survey Initiative from the World Health Organization (WHO) Composite International Diagnostic Interview (WHO-CIDI) (Kessler and Üstün, 2004). Diagnostic algorithms developed by the survey designers yielded valid and reliable diagnoses of these disorders that corresponded to DSM-IV diagnostic criteria (Kessler and Üstün, 2004). In addition, the WMH-CIDI contained numerous modules for collecting extensive demographic, cultural, and health information.

The survey was administered by trained lay interviewers in respondents' homes or over the telephone when requested by the interviewee. The rate of missing data was very low (Pennell et al., 2004). A more detailed explanation of the logistics of the surveys has been written elsewhere (Pennell et al., 2004).

Predictor Variables

Nativity status was a nominal variable with two levels of response: US-born and foreign-born. *Duration of residence* was an ordinal variable with four levels of response: US Born, immigrant in residence for ≥ 21 years, immigrant in residence for 11–20 years, and immigrant in residence for 0–10 years. These cutpoints had been used in prior work with this dataset (Cook et al., 2009; Takeuchi et al., 2007; Williams et al., 2007). *Age at immigration* was a nominal variable with two levels of response: in-US-as-child (born in US, immigrated at age 0–6 years), and later-arrival-immigrant (immigrated after age 6). These groupings were empirically supported had been used in previous literature (Alegria et al., 2007a).

Dependent variable

The *Premenstrual Dysphoric Disorder (PMDD)* variable had three mutually exclusive levels of response: *PMDD*, *any premenstrual symptoms*, and the *absence of premenstrual symptoms*. The lifetime prevalence of PMDD was assessed with the World Mental Health-Composite International Diagnostic Interview (WMH-CIDI) "Premenstrual Syndrome" module, corresponding to DSM-IV-TR criteria for PMDD (Association, 2000). A woman was positively identified as having *PMDD* if she reported (in her lifetime) (a) experiencing depressed mood, anxiety, or irritability in the week prior to her period (b) in at least seven of twelve menstrual cycles (when these symptoms were at their most frequent and severe) (c)

that these mood changes were worse than normal most of the time, (d) and symptoms such as difficulty concentrating, tiredness, change in appetite, or change in sleep were present. She also had to report (e) interference in work, social life, or personal relationships, or (f) impairment in daily activities because of these problems. Women with *any premenstrual symptoms* had at least one of the first four symptoms but did not meet criteria for PMDD. Women without symptoms were categorized as having an *absence of premenstrual symptoms*.

Covariates

We included correlates of premenstrual symptoms and PMDD (Cohen et al., 2002; Deuster et al.; Halbreich et al., 2003). These include race/ethnicity (*Asian*, includes Vietnamese, Filipino, Chinese, or all other Asian; *Latina*, includes Cuban, Puerto Rican, Mexican, or all other Latina; and *Black*, includes Afro-Caribbean or African American), smoking status (*current smoker*, *ex-smoker*, or *never smoker*), current age (*range 18–59 years*), history of oral contraceptive use (*never users* or *ever users*), age at menarche (*range 10–22 years*), employment status (*employed*, *not employed*, or *not in the labor force*), educational attainment (*less than high school*, *high school diploma*, *some college*, or *college and above*), income (*range 0–17*; this value is calculated by dividing the total family income by the poverty threshold for a family of that size (U.S. Census Bureau, 2009)), and diagnosis of a mood disorder in the past-month (*yes* or *no*; includes bipolar depression dysthymia, hypomania, major depressive disorder, major depressive episode, and mania). We also controlled for socially desirable reporting using a 10-item scale developed by Crowne and Marlowe (*range 0–10*) (Crowne and Marlowe, 1960).

Data Analysis

Taylor Series Linearization in SUDAAN 10 account the clustering and weighting of the CPES survey data (International, 2008). Weighting variables were used at all stages of analysis and were provided by the survey designers. We used SUDAAN 10 for descriptive statistics, modeling procedures, and hypothesis testing, and completed data management and selected model diagnostics with SAS 9.1.

We used PROC CROSSTAB and PROC DESCRIPT to produce the univariate statistics. We obtained unadjusted odds ratios for our independent variables and covariates using PROC MULTLOG for multinomial logistic regression models, modeling *any premenstrual symptoms* and *PMDD*, separately, against the reference category *absence of premenstrual symptoms*. We then constructed separate multivariate multinomial logistic regression models for nativity status, age at immigration, and generational status in PROC MULTLOG. The predictor variable and all of the covariates listed above entered each model in a single step. We also added an interaction term to each model (race*nativity status, race*duration of residence, race*age at immigration) to determine whether the effects of each predictor variable varied by race. The statistical significance of all model variables was evaluated with the Wald-Chi Squared test. We obtained multivariate-adjusted odds ratios and their corresponding 95% confidence intervals in this analysis. Finally, we evaluated the fit and assumptions of our multinomial regression models in SAS 9.1 (Tabachnick and Fidell, 2006).

Results

In support of our first hypothesis, the likelihood of PMDD was lower in foreign-born ethnic minorities, compared to US-born ethnic minorities. This was also true for the reporting of any premenstrual symptoms (OR=0.76; 95% CI=0.61–0.94). These associations were independent of race/ethnicity, employment status, educational attainment, smoking status,

oral contraceptive use, self-rated physical health, self-rated mental health, current age, income, past month mood disorder, and social desirability bias (Table 2 and Figure 1). In support of our second hypothesis, the likelihood of PMDD increased in a dose-response fashion as duration of residence increased, independently of the covariates listed above. Compared to US-born ethnic minorities, women residing in the US for at least twenty one years were 45% less likely to experience PMDD, women residing in the US for eleven to twenty years were 68% less likely to experience PMDD, and women residing in the US for ten years or less were 72% less likely to experience PMDD. Although foreign-born women were significantly less likely than US-born women to report any premenstrual symptoms, the dose-response pattern according to duration was not observed.

In support of our third hypothesis, later-arrival-immigrants were significantly less likely than in-US-as-child women to experience PMDD, controlling for the covariates listed above (Table 2 and Figure 1). Later-arrival-immigrants were also significantly less likely than in-US-as-child women to experience any premenstrual symptoms, although these effects were attenuated (OR=0.75, 95% CI 0.61–0.92).

The interactions of race and nativity status, duration of residence, and age at arrival did not reach statistical significance, with p-values for the interaction of 0.485, 0.155, and 0.152, respectively. In multivariate¹ analysis oral contraceptive use, smoking status, employment status, income, and past-month diagnosis of mood disorder remained associated with PMDD status ($p < 0.05$; Table 1). There were no violations of model assumptions and fit for any of the three final models.

Discussion

The results of this analysis supported our three study hypotheses. Extending findings in the psychiatric literature (Breslau et al., 2009; Escobar et al., 2000; Takeuchi et al., 2007; Vega et al., 1998; Vega et al., 2004; Williams et al., 2007), we demonstrated that nativity status, duration of residence, and age at immigration were independently and significantly associated with the lifetime prevalence of PMDD among ethnic minority women. In support of the acculturation model, the likelihood for PMDD was lower among foreign-born, compared to US-born, ethnic minority women. Furthermore, the likelihood of PMDD increased in a dose-response fashion according to length of residence in the US, with those born in the United States demonstrating the greatest likelihood for PMDD in their lifetimes. Finally, later-arrival immigrants who spent their early childhood outside of the US had significantly lower odds for PMDD in their lifetimes, compared to US-born women and immigrants who arrived in the US before age six.

We found an identical pattern of results for the reporting of any premenstrual symptoms in association with nativity status and age at immigration. This secondary finding lends support to our main findings with respect to PMDD. Furthermore, it is notable that the effects of these proxy measures for acculturation are larger in magnitude in association with PMDD, compared to the reporting of any premenstrual symptoms. According to anthropological sources, notions of premenstrual *symptoms* exist worldwide, while premenstrual *syndromes* (PMDD) tend to exist in Western societies only (Johnson, 1987). Since PMDD is largely absent from discourse in non-Western cultures, we should expect, and found, that the effect of acculturation measures is stronger with respect to PMDD, versus reporting any premenstrual symptoms among ethnic minorities. Accordingly, because ethnic minority immigrants have an understanding of premenstrual symptoms prior to their exposure to

¹Results are presented for model including duration of residence because the relationships between covariates and outcomes do not differ meaningfully among the three models.

American culture, we should expect, and found, that the magnitude of the association between measures of acculturation and reporting any premenstrual symptoms is slightly attenuated among minorities in our study

The effects of acculturation variables appear to be consistent across racial groups in our sample. The interactions of race with nativity status, age at arrival, and duration of residence were not statistically significant.

The findings in our study are not fully attributable to the “healthy immigrant effect.” The associations between each of our three measures of acculturation and PMDD were unchanged by the introduction of self-rated mental and physical health into the models. This suggests that it is unlikely that the effects we observed were due to the better health of newly-arrived immigrants. Furthermore, a recent study of immigrants and persons who remained in their country of origin suggested that immigration status was unrelated to health status, providing little support for the “healthy immigrant effect” (Rubalcava et al., 2008).

Our study’s strengths and innovations make it a valuable contribution to the literature on PMDD. First, to our knowledge, this is a novel application of the acculturation model to the investigation of PMDD. Second, we include a wider range of covariates than has been applied in prior work on PMDD. Third, our study sample comes from the combined populations of the NLAAS and NSAL, and is randomly selected and nationally representative. The results from this general population sample are more readily generalizable than those derived from samples in previous American studies, which utilized small, racially homogenous samples (Cohen et al., 2002) or convenience samples (Fontana and Palfai, 1994). Fourth, the oversampling of minorities and immigrants in the CPES make it uniquely suited for our analysis. We also utilized a widely accepted measure of PMDD (Perkonig et al., 2004; Pezawas et al., 2003; Stein et al., 2002; Wittchen et al., 2002) to minimize information bias and provide estimates of PMDD in the general population as well as among particular population groups.

Another advantage of our study is that we have three measures of acculturation, nativity status, age at immigration, and duration of residence, which are widely used in the public health literature to assess immigrants’ adjustment to and integration with majority culture. Abraido-Lanza and colleagues (Abraido-Lanza et al., 2006) argue that the complex nature of the acculturative experience is not completely captured by any single measure. By using all three measures we increase our ability to capture the degree to which individuals become acculturated and maintain elements of their native culture. Further, all three measures show that greater exposure to American culture increases the likelihood for PMDD. This finding suggests that the measures are assessing complementary aspects of acculturation.

The results of this study must be interpreted in light of the context of the design of the NLAAS and NSAL. First, in this cross-sectional design, exposures and outcomes are measured at the same point in time, making temporality sometimes hard to interpret. Although nativity status is a fixed exposure in relation to PMDD, we cannot determine if the onset of symptoms occurred before or after arrival in the US, making temporality difficult to establish for age at immigration and duration of residence. Second, this sample only included Black participants who could speak English. Consequently, Black immigrants who are the least acculturated were not included. It is possible that inclusion of this group would have led to stronger effects than what we observed.

Finally, while WMH-CIDI module has been used in prior studies to diagnose PMDD (Perkonig et al., 2004; Pezawas et al., 2003; Stein et al., 2002; Wittchen et al., 2002), and it meets the symptom content of the DSM-IV-TR criteria for PMDD, it only assesses symptoms at one time point. The DSM-IV-TR states that Criterion A (affective and somatic

symptoms) and Criterion B (functional impairment) should be confirmed by prospective symptom reporting collected over two consecutive, symptomatic menstrual cycles (Criterion D)². However, the diagnosis of PMDD may be made “provisionally” if Criterion D is not met. Given the cross-sectional design and large sample size of the NSAL and NLAAS, prospective data for two time points could not be collected, and retrospective reporting of lifetime symptoms was used instead. However, all of the women in this sample are premenopausal, and thus memories of current or recent premenstrual symptoms are readily accessible. Furthermore, we controlled for a global measure of self-rated mental health, as well as the presence of past-month mood disorders, to eliminate the potential confounding effects of current mental states on symptom reporting. Finally, we included the Crowne-Marlowe scale to control for social desirability in symptom reporting. This is a unique strength of our study of PMDD, as no other examinations of PMDD utilize this measure.

Our investigation suggested that nativity status, duration of residence in the US, and age at immigration were significantly associated with PMDD among ethnic minority women, with the lifetime prevalence of PMDD highest among those with the greatest exposure to American culture. The mechanisms of acculturation that contribute to women’s susceptibility to PMDD need further exploration. With this understanding, clinicians may be able to target these mechanisms to lower the prevalence of PMDD among a growing segment of the US population.

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References

- Abraído-Lanza A, Armbrister A, Flórez K, Aguirre A. Toward a theory-driven model of acculturation in public health research. *Am J Public Health*. 2006; 96:1342–1346. [PubMed: 16809597]
- Alegria M, Canino G, Stinson F, Grant B. Nativity and DSM-IV psychiatric disorders among Puerto Ricans, Cuban Americans, and non-Latino Whites in the United States: results from the National Epidemiologic Survey on Alcohol and Related Conditions. *J Clin Psychiatry*. 2006; 67:56–65. [PubMed: 16426089]
- Alegria M, Shrout P, Woo M, Guarnaccia P, Sribney W, Vila D, Polo A, Cao Z, Mulvaney-Day N, Torres M, Canino G. Understanding differences in past year psychiatric disorders for Latinos living in the US. *Soc Sci Med*. 2007a; 65:214–230. [PubMed: 17499899]
- Alegria M, Sribney W, Woo M, Torres M, Guarnaccia P. Looking Beyond Nativity: The Relation of Age of Immigration, Length of Residence, and Birth Cohorts to the Risk of Onset of Psychiatric Disorders for Latinos. *Res Hum Dev*. 2007b; 4:19–47. [PubMed: 19412354]
- Alegria M, Takeuchi D, Canino G, Duan N, Shrout P, Meng X, Vega W, Zane N, Vila D, Woo M, Vera M, Guarnaccia P, Aguilar-Gaxiola S, Sue S, Escobar J, Lin K, Gong F. Considering context, place and culture: the National Latino and Asian American Study. *Int J Methods Psychiatr Res*. 2004; 13:208–220. [PubMed: 15719529]

²Criterion C, which is the determination that symptoms are not exacerbations of another affective or anxiety disorder, must also be confirmed prospectively.

- Alegría M, Mulvaney-Day N, Torres M, Polo A, Cao Z, Canino G. Prevalence of psychiatric disorders across Latino subgroups in the United States. *Am J Public Health*. 2007; 97:68–75. [PubMed: 17138910]
- Association, AP. Diagnostic and Statistical Manual of Mental Disorders DSM-IV-TR. American Psychiatric Publishing, Inc; 2000.
- Bernstein, R.; Edwards, T. US Census Press Releases: An Older and More Diverse Nation by Midcentury. U.S. Census Bureau; 2008.
- Breslau J, Aguilar-Gaxiola S, Borges G, Kendler K, Su M, Kessler R. Risk for psychiatric disorder among immigrants and their US-born descendants: evidence from the National Comorbidity Survey Replication. *J Nerv Ment Dis*. 2007; 195:189–195. [PubMed: 17468677]
- Breslau J, Borges G, Hagar Y, Tancredi D, Gilman S. Immigration to the USA and risk for mood and anxiety disorders: variation by origin and age at immigration. *Psychol Med*. 2009; 39:1117–1127. [PubMed: 19000338]
- Breslau J, Chang D. Psychiatric disorders among foreign-born and US-born Asian-Americans in a US national survey. *Soc Psychiatry Psychiatr Epidemiol*. 2006; 41:943–950. [PubMed: 16988789]
- Cohen L, Soares C, Otto M, Sweeney B, Liberman R, Harlow B. Prevalence and predictors of premenstrual dysphoric disorder (PMDD) in older premenopausal women. The Harvard Study of Moods and Cycles. *J Affect Disord*. 2002; 70:125–132. [PubMed: 12117624]
- Cook B, Alegría M, Lin J, Guo J. Pathways and correlates connecting Latinos' mental health with exposure to the United States. *Am J Public Health*. 2009; 99:2247–2254. [PubMed: 19834004]
- Crowne DP, Marlowe D. A new scale of social desirability independent of psychopathology. *Journal of Consulting Psychology*. 1960; 24:349–354. [PubMed: 13813058]
- Deuster P, Adera T, South-Paul J. Biological, social, and behavioral factors associated with premenstrual syndrome. *Arch Fam Med*. 8:122–128. [PubMed: 10101982]
- Escobar J, Hoyos Nervi C, Gara M. Immigration and mental health: Mexican Americans in the United States. *Harv Rev Psychiatry*. 2000; 8:64–72. [PubMed: 10902095]
- Figert A. Premenstrual syndrome as scientific and cultural artifact. *Integr Physiol Behav Sci*. 2005; 40:102–113. [PubMed: 17393679]
- Fontana A, Palfai T. Psychosocial factors in premenstrual dysphoria: stressors, appraisal, and coping processes. *J Psychosom Res*. 1994; 38:557–567. [PubMed: 7990064]
- Halbreich U, Borenstein J, Pearlstein T, Kahn L. The prevalence, impairment, impact, and burden of premenstrual dysphoric disorder (PMS/PMDD). *Psychoneuroendocrinology*. 2003; 28(Suppl 3):1–23.
- Heeringa, SG.; Berglund, P. Integrated Weights and Sampling Error Codes for Design-based Analysis. Statistical Design Group, Survey Research Center, University of Michigan; 2007. National Institutes of Mental Health (NIMH) Collaborative Psychiatric Epidemiology Survey Program (CPES) Data Set.
- International, R. About SUDAAN. 2008.
- Jackson J, Torres M, Caldwell C, Neighbors H, Nesse R, Taylor R, Trierweiler S, Williams D. The National Survey of American Life: a study of racial, ethnic and cultural influences on mental disorders and mental health. *Int J Methods Psychiatr Res*. 2004; 13:196–207. [PubMed: 15719528]
- Johnson T. Premenstrual syndrome as a western culture-specific disorder. *Cult Med Psychiatry*. 1987; 11:337–356. [PubMed: 3677777]
- Kessler R, Üstün T. The World Mental Health (WMH) Survey Initiative Version of the World Health Organization (WHO) Composite International Diagnostic Interview (CIDI). *Int J Methods Psychiatr Res*. 2004; 13:93–121. [PubMed: 15297906]
- Lara M, Gamboa C, Kahramanian M, Morales L, Bautista D. Acculturation and Latino health in the United States: a review of the literature and its sociopolitical context. *Annu Rev Public Health*. 2005; 26:367–397. [PubMed: 15760294]
- Larsen, LJ. The Foreign- Born Population in the United States: 2003., Current Population Reports. U.S. Census Bureau; Washington, D.C: 2004. p. 20-551.
- Levin J, Chatters L, Taylor R. Religious effects on health status and life satisfaction among black Americans. *J Gerontol B Psychol Sci Soc Sci*. 1995; 50:S154–163. [PubMed: 7767699]

- Marván M, Escobedo C. Premenstrual symptomatology: role of prior knowledge about premenstrual syndrome. *Psychosom Med*. 61:163–167. [PubMed: 10204968]
- Mulvaney-Day N, Alegria M, Sribney W. Social cohesion, social support, and health among Latinos in the United States. *Soc Sci Med*. 2007; 64:477–495. [PubMed: 17049701]
- Ornitz A, Brown M. Family coping and premenstrual symptomatology. *J Obstet Gynecol Neonatal Nurs*. 1993; 22:49–55.
- Passel, J.; Cohn, DV. US Population Projections: 2005–2050. Pew Research Center Publications. Pew Research Center; 2008. Immigration to Play Lead Role in Future U.S. Growth.
- Pennell B, Bowers A, Carr D, Chardoul S, Cheung G, Dinkelmann K, Gebler N, Hansen S, Pennell S, Torres M. The development and implementation of the National Comorbidity Survey Replication, the National Survey of American Life, and the National Latino and Asian American Survey. *Int J Methods Psychiatr Res*. 2004; 13:241–269. [PubMed: 15719531]
- Perkonig A, Yonkers K, Pfister H, Lieb R, Wittchen H. Risk factors for premenstrual dysphoric disorder in a community sample of young women: the role of traumatic events and posttraumatic stress disorder. *J Clin Psychiatry*. 2004; 65:1314–1322. [PubMed: 15491233]
- Pezawas L, Wittchen H, Pfister H, Angst J, Lieb R, Kasper S. Recurrent brief depressive disorder reinvestigated: a community sample of adolescents and young adults. *Psychol Med*. 2003; 33:407–418. [PubMed: 12701662]
- Pilver C, Desai R, Kasl S, Levy B. Perceived discrimination as a risk factor for Premenstrual Dysphoric Disorder among ethnic minority women. in preparation.
- Rubalcava L, Teruel G, Thomas D, Goldman N. The healthy migrant effect: new findings from the Mexican Family Life Survey. *Am J Public Health*. 2008; 98:78–84. [PubMed: 18048791]
- Stein M, Höfler M, Perkonig A, Lieb R, Pfister H, Maercker A, Wittchen H. Patterns of incidence and psychiatric risk factors for traumatic events. *Int J Methods Psychiatr Res*. 2002; 11:143–153. [PubMed: 12459818]
- Suarez-Orozco, C.; Suarez-Orzoco, M. Children of Immigration. Harvard University Press; Cambridge, MA: 2001.
- Tabachnick, B.; Fidell, L. Using Multivariate Statistics. Allyn & Bacon; 2006.
- Takeuchi D, Zane N, Hong S, Chae D, Gong F, Gee G, Walton E, Sue S, Alegria M. Immigration-related factors and mental disorders among Asian Americans. *Am J Public Health*. 2007; 97:84–90. [PubMed: 17138908]
- U.S. Census Bureau, H.a.H.E.S.D.. Poverty-How the Census Bureau Measures Poverty. 2009.
- U.S. Department of Health and Human Services, P.H.S., National Institutes of Health. Agenda for Research on Women's Health for the 21st Century. NIH; Bethesda: 1999.
- Vega W, Kolody B, Aguilar-Gaxiola S, Alderete E, Catalano R, Caraveo-Anduaga J. Lifetime prevalence of DSM-III-R psychiatric disorders among urban and rural Mexican Americans in California. *Arch Gen Psychiatry*. 1998; 55:771–778. [PubMed: 9736002]
- Vega W, Sribney W, Aguilar-Gaxiola S, Kolody B. 12-month prevalence of DSM-III-R psychiatric disorders among Mexican Americans: nativity, social assimilation, and age determinants. *J Nerv Ment Dis*. 2004; 192:532–541. [PubMed: 15387155]
- Warner P, Bancroft J. Factors related to self-reporting of the pre-menstrual syndrome. *Br J Psychiatry*. 1990; 157:249–260. [PubMed: 2224376]
- Williams D, Haile R, González H, Neighbors H, Baser R, Jackson J. The mental health of Black Caribbean immigrants: results from the National Survey of American Life. *Am J Public Health*. 2007; 97:52–59. [PubMed: 17138909]
- Wittchen H, Becker E, Lieb R, Krause P. Prevalence, incidence and stability of premenstrual dysphoric disorder in the community. *Psychol Med*. 2002; 32:119–132. [PubMed: 11883723]
- Woods N, Most A, Longenecker G. Major life events, daily stressors, and perimenstrual symptoms. *Nurs Res*. 1985; 34:263–267. [PubMed: 3850485]
- Zhang W, Ta V. Social connections, immigration-related factors, and self-rated physical and mental health among Asian Americans. *Soc Sci Med*. 2009; 68:2104–2112. [PubMed: 19427087]

Figure 1. Nativity status, duration of residence, age at immigration, and PMDD among ethnic minority women.

Table 1

Univariate, bivariate, and multivariate associations of demographic characteristics and Premenstrual Dysphoric Disorder

Demographic characteristic	N ^a	% ^b	OR ^c	95% CI	A-OR ^{c,d}	95% CI
Race						
Asian	799	17.03	0.81	0.45–1.46	1.33	0.63–2.79
Latina	1,037	42.22	0.62	0.34–1.11	1.16	0.58–2.35
Black	2,020	40.75	1.00	--	1.00	--
Employment status						
Employed	2,615	62.48	1.00	--	1.00	--
Unemployed	434	11.22	1.16	0.68–1.97	1.57	0.86–2.87
Not in labor force	807	26.30	0.76	0.42–1.38	1.82	0.89–3.73
Educational attainment						
Less than high school	792	27.25		0.31–1.40	0.63	0.27–1.48
High school graduate	1,121	28.37	1.00	--	1.00	--
Some college	1,066	26.58	1.86	0.97–3.57	1.73	0.90–3.34
College or above	877	17.80	1.71	0.87–3.36	1.82	0.89–3.73
Smoking status						
Current	641	16.87	3.82	2.16–6.75	2.96	1.66–5.28
Former	344	9.16	3.15	1.78–5.58	2.05	1.08–3.90
Never	2,869	73.96	1.00	--	1.00	--
Oral contraceptive use						
Ever user	2,530	64.67	1.82	1.08–3.05	1.00	0.54–1.88
Never user	1,324	35.33	1.00	--	1.00	--
Mood disorder						
Yes	132	3.27	9.52	4.59–19.78	6.65	2.84–15.56
No	3,724	96.73	1.00	--	1.00	--
	Mean	SE				
Self-rated physical health	3.42	0.02	0.71	0.57–0.88	0.86	0.65–1.14
Self-rated mental health	3.81	0.02	0.66	0.49–0.88	0.82	0.59–1.12
Current age	32.66	0.29	1.03	1.00–1.05	1.02	1.00–1.04
Age at menarche	12.69	0.04	0.90	0.79–1.02	0.96	0.85–1.09

Demographic characteristic	N ^a	% ^b	OR ^c	95% CI	A-OR ^{c,d}	95% CI
Income	4.06	0.12	1.07	1.00–1.15	1.07	0.98–1.16

^aN=3,856; Numbers might not sum to total because of missing data

^bWeighted %

^cNon-event is absence of symptoms

^dModel is adjusted for: race/ethnicity, employment status, educational attainment, smoking status, oral contraceptive use, self-rated physical health, self-rated mental health, current age, income, past month mood disorder, and social desirability bias.

Table 2

Analysis of nativity status, duration of residence, age at immigration, and PMDD

	N ^a	% ^b	A-OR ^{c,d}	95% CI
Nativity Status				
Foreign Born	1,687	40.27	0.38	0.21–0.68
US Born	2,162	59.73	1.00	--
Duration of residence (years)				
0–10	643	15.86	0.28	0.11–0.70
11–20	575	14.74	0.32	0.13–0.75
≥21	454	9.54	0.55	0.26–1.16
US Born	2,162	59.85	1.00	--
Age at immigration				
Late arrival immigrant	1,475	34.99	0.33	0.18–0.62
In US as Child	2,361	65.01	1.00	--

^aN=3,856; Numbers might not sum to total because of missing data^bWeighted %^cNon-event is absence of symptoms^dModel is adjusted for: race/ethnicity, employment status, educational attainment, smoking status, oral contraceptive use, self-rated physical health, self-rated mental health, current age, income, past month mood disorder, and social desirability bias.