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Change in Binge Eating and Binge Eating Disorder Associated with Migration from Mexico to the US

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Abstract

Exposure to Western popular culture is hypothesized to increase risk for eating disorders. This study tests this hypothesis with respect to the proposed diagnosis of Binge Eating Disorder (BED) in an epidemiological sample of people of Mexican origin in Mexico and the US. Data come from the Mexico National Comorbidity Survey, National Comorbidity Survey Replication, and National Latino and Asian American Survey (N=2268). Diagnoses were assessed with the WMH-CIDI. Six groups were compared: Mexicans with no migrant family members, Mexicans with at least one migrant family member, Mexican return-migrants, Mexican-born migrants in the US, and two successive generations of Mexican-Americans in the US. The lifetime prevalence of BED was 1.6% in Mexico and 2.2% among Mexican-Americans. Compared with Mexicans in families with migrants, risk for BED was higher in US-born Mexican-Americans with two US-born parents (aHR=2.58, 95% CI 1.12-5.93). This effect was attenuated by 24% (aHR=1.97, 95% CI 0.84-4.62) with adjustment for prior-onset depressive or anxiety disorder. Adjustment for prior-onset conduct disorder increased the magnitude of association (aHR=2.75, 95% CI 1.22-6.20). A similar pattern was observed for binge eating. Among respondents reporting binge eating, onset in the US (vs. Mexico) was not associated with prevalence of further eating disorder symptoms. Migration from Mexico to the US is associated with an increased risk for BED that may be partially attributable to non-specific influences on internalizing disorders. Among respondents reporting binge eating in either country, similar levels of further symptoms were endorsed, suggesting some cross-cultural generalizability of criteria.

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Author Disclosure

Ms. Swanson, Ms. Saito, and Drs. Borges, Benjet, Aguilar-Gaxiola, Medina-Mora, and Breslau report no competing interests.

Keywords

binge eating disorder; migration; eating disorder

Introduction

Binge Eating Disorder (BED), a diagnosis described provisionally in the appendix to DSM-IV and proposed for inclusion in DSM-5, is characterized by recurrent episodes of binge eating, i.e. eating objectively large amounts of food with loss of control. To meet the diagnostic criteria, the episodes of binge eating must be accompanied by further symptoms, such as eating much more rapidly than usual and eating alone due to embarrassment, and marked psychological distress (American Psychiatric Association, 1994; American Psychiatric Association DSM-5 Task Force, 2010). Epidemiological studies have found BED to be associated with a broad range of comorbid psychiatric disorders, including mood, anxiety, impulse control and substance use disorders (Hudson, Hiripi, Pope, & Kessler, 2007; Preti et al., 2009; Swanson, Crow, le Grange, Swendsen, & Merikangas, 2011), role impairment (Hudson et al., 2007; Preti et al., 2009; Swanson et al., 2011), and suicidality (Swanson et al., 2011). There is some evidence that, as has been found for other eating disorder symptoms (Becker, Burwell, Gilman, Herzog, & Hamburg, 2002; Becker et al., 2011), binge eating episodes are associated with exposure to popular culture of the US and other Western countries in which thin bodies and strict weight management are strongly valued. Notably, among Latinos in the US, risk for binge eating is less common among immigrants to the US than among the US-born (Alegria et al., 2007). This is of particular concern since there is also evidence that the prevalence of binge eating is higher among Latinos than among Non-Hispanic Whites (Marques et al., 2010). To date, however, binge eating and BED have not been examined in cross-national studies that would provide a clearer test of their hypothesized association with exposure to particular cultural influences.

This study examines the association of binge eating and BED with migration between Mexico and the US in a unique transnational general population sample. We test the hypothesis that exposure to the US is associated with higher risk by comparing successive generations of Mexican-Americans in the US with the migrant source population in Mexico. In addition, we address two further issues. First, we examine whether the association between migration and risk for binge eating or BED is attributable to prior onset psychiatric disorders. Previous research has found a strong association between migration to Western countries and increased risk for a broad range of psychiatric disorders, including many types of internalizing and externalizing disorders (Alegría et al., 2008; Breslau, Borges, Hagar, Tancredi, & Gilman, 2008a; Cantor-Graae & Selten, 2005; Fearon & Morgan, 2006); further research supports strong associations between BED and comorbid mood/anxiety and impulse control disorders (Hudson et al., 2007; Preti et al., 2009; Swanson et al., 2011; Wonderlich, Gordon, Mitchell, Crosby, & Engel, 2009). This is an important hypothesis to test because the influence of migration on BED might result from generalized effects on psychopathology rather than factors hypothesized to have specific effects on disordered eating. The environment brings exposure to many factors beyond just eating habits and body image ideals, and it has not been previously explored whether an association between eating disorders and exposure to Western culture is best accounted for by such specific factors or some general set of factors associated with psychopathology broadly. Second, we examine whether migration is associated with differences in cognitive and behavioral symptoms of BED and other eating disorders among people who report binge eating. Such differences might indicate cultural variation in psychiatric implications of binge eating that should be taken into account in the design of the DSM-5 criteria. The pertinence of specific symptoms

among people with episodes of binge eating has not been previously examined in cross-cultural epidemiological data.

Materials and Methods

Sample

Data come from surveys conducted in Mexico and the US using the same face-to-face interview, the World Mental Health version of the Composite International Diagnostic Instrument (WMH-CIDI) (Kessler & Ustun, 2004c). The Mexican National Comorbidity Survey (MNCS) (Medina-Mora et al., 2005), is based on a stratified, multistage area probability sample of household residents in Mexico aged 18 to 65 years, who lived in communities of at least 2,500 people. 5,782 respondents were interviewed between September 2001 and May 2002. The response rate was 76.6%. Data on the Mexican-origin population in the US come from two component surveys of the Collaborative Psychiatric Epidemiology Surveys (CPES) (Heeringa et al., 2004), the National Comorbidity Survey Replication (NCSR) (Kessler & Merikangas, 2004a) and the National Latino and Asian American Survey (NLAAS) (Alegria et al., 2004). The NCSR is based on a stratified multistage area probability sample of the English-speaking household population of the continental United States (Kessler et al., 2004b). The NLAAS is based on the same sampling frame as the NCSR, supplemented to increase representation of target ethnic groups, including monolingual Spanish speakers (Alegria et al., 2004). The NCSR was conducted from 2001 through 2003 and had a 70.9% response rate; the NLAAS was conducted from 2002 through 2003 and had a 75.5% response rate for the Latino sample. In the CPES, 1,442 respondents are of Mexican origin. The Spanish diagnostic modules of the WMH-CIDI, used in both the MNCS and NLAAS, were developed following WHO instrument translation guidelines. These procedures involve extensive translation and back translation of the instruments as well as a field-testing period prior to the start of data collection (Harkness et al., 2008).

For the NCSR and MNCS, some disorders were only assessed in a second-stage subsample; eating disorders were assessed in a 50% random subsample of this Part 2 sample. Eating disorders were assessed in the full sample for the NLAAS. Combining the surveys resulted in a cross-national sample of 2,268 respondents, 1,234 in Mexico and 1,034 in the US.

Study procedures were approved by the Institutional Review Boards of Harvard Medical School, the University of Michigan, and the National Institute of Psychiatry Ramon de la Fuente.

Definition of Migrant Groups

Respondents in the MNCS were asked whether they had ever migrated to the United States and whether they had a member of their immediate family living in the US. Respondents to the CPES were asked their country of birth and whether their parents were born in the US. CPES respondents born outside of the US were asked the age at which they first arrived in the US. The sample was divided into six groups representing populations across the range of exposure to the US. The six groups are: (1) Mexicans with no migrant in their immediate family; (2) Mexicans with a migrant in their immediate family; (3) Return migrants (Mexicans with a history of migration to the US); (4) Mexican-born immigrants in the US; (5) US-born Mexican-Americans with at least one foreign-born parent; and (6) US-born Mexican-Americans with two US-born parents.

Assessment of Binge Eating and BED

The lifetime occurrence of binge eating was assessed by the following question: “The next question is about ‘eating binges’ where a person eats a large amount of food during a short time like two hours. By ‘a large amount’ I mean eating so much food that it would be like eating two or more entire meals in one sitting, or eating so much of one particular food – like candy or ice cream – that it would make most people feel sick. With that definition in mind, did you ever have a time in your life when you went on eating binges at least twice a week for several months or longer?” Respondents who endorsed binge eating were asked the age they first experienced these episodes.

The WMH-CIDI assesses three eating disorders: DSM-IV anorexia nervosa and BN, and the proposed BED definition in the DSM-IV appendix. Hierarchy rules were enforced, in that a BED diagnosis was only given when it clearly occurred during a time that neither AN nor BN were present. Binge eating was evaluated without hierarchy enforcement.

Associated symptoms were evaluated in the subsample of respondents who endorsed the above binge eating question. These include the five binge-associated criterion symptoms proposed for DSM-5 (eating more rapidly than normal; eating until uncomfortably full; eating large amounts when not feeling physically hungry; eating alone because of embarrassment; feeling disgusted with oneself, depressed, or guilty afterward), two questions assessing shape or weight concerns, and six types of weight-control behaviors (purging [self-induced vomiting, use of diuretics or related weight-control medications, use of laxatives or enemas and chewing/spitting] and non-purging types [fasting and excessive exercise]).

Assessment of Other Psychiatric Disorders

The WMH-CIDI assesses DSM-IV criteria and age of first onset for conduct disorder, major depressive episode, dysthymia, generalized anxiety disorder, panic disorder, agoraphobia, social phobia and posttraumatic stress disorder. Clinical reappraisal studies in the NCSR (Kessler et al., 2005) and the World Mental Health Surveys (Haro et al., 2006), in which the WMH-CIDI diagnoses were compared with structured clinical interviews administered by mental health professionals, showed good concordance for mood and anxiety disorders. Although the diagnosis of conduct disorder has not been examined in clinical validity studies, analysis of the NCSR sample show strong associations of the WMH-CIDI diagnosis of CD with established demographic correlates, including male sex, low educational attainment (Breslau, Lane, Sampson, & Kessler, 2008b), urban residence, and divorce (Nock, Kazdin, Hiripi, & Kessler, 2006) as well as high levels of risk for other psychiatric disorders (Nock et al., 2006).

Statistical Analysis

The lifetime prevalence of binge eating and BED were compared across the six migrant categories described above using design-adjusted chi-square tests. Associations between risk for BED and binge eating with migration category, adjusted for sex and age cohort, were examined in discrete time survival models (Efron, 1988) with chronological age as the time scale. Migration category was entered as a time-varying status for migrants; person-years up through the age of migration were counted towards the ‘family member of migrant’ category and person-years subsequent to the age of migration were counted toward the ‘migrant in the US’ category. The ‘family member of migrant’ category was specified as the reference group since this category represents the families of origin of the US Mexican-American population. In order to investigate the influence of non-specific liability to psychiatric disorder associated with migration, additional time-varying statistical adjustments were added for prior onset of depressive or anxiety disorder and conduct disorder. Three models

were estimated for each outcome, a model with adjustment for age and sex, a model with adjustment for age, sex, and depressive or anxiety disorder, and a model with adjustment for age, sex, and conduct disorder. Due to sample size limitations, analyses of symptom endorsements among respondents who endorsed binge eating assessed differences between those whose binge eating onset occurred in Mexico versus the US; design-adjusted chi-square tests are presented.

The sample design specification variables for the combined MNCS/CPES employed the primary stratum and primary sampling unit identification codes and the sampling weight variables developed by the sample design team at the Institute for Social Research, including the integrated CPES sampling design and weight variable they developed to account for the overlapping coverage of Mexican-Americans by the NCSR and NLAAS (Heeringa & Berglund, 2007; Heeringa et al., 2004). Sampling stratification variables were modified to ensure that codes used for the CPES and MNCS components did not overlap. Sampling weights reflect adjustments for unequal selection and response probabilities as well as post-stratification adjustments to enhance the representativeness of weighted inferences with respect to national census estimates of target population sizes. An additional rescaling factor was applied to the sampling weights in the cross-national dataset so that the weighted sample sizes would reflect the relative sizes of the Mexican-origin target populations in Mexico and the US, enhancing the suitability of the weights for use in design-based analyses involving the full population as well as population subgroups (Heeringa et al., 2007; Kish, 1999). Analyses were conducted using SUDAAN (RTI, 2005).

Results

Demographic information on the 2,268 respondents who were assessed for eating disorders is presented in **Table 1** by the six migrant groups ($n=600, 564, 70, 524, 254,$ and 256 , respectively). There are significant sex differences across these groups ($p=0.002$), with males being overrepresented (79.2%) in Group 3, return migrants, compared to other groups. We further observe significant differences by age cohort ($p<0.001$), with younger respondents overrepresented in Group 5, the US-born with at least one foreign-born parent.

Of the entire sample, 4.2% endorsed episodes of binge eating and 1.7% met full criteria for BED (**Table 2**). Comparing respondents based off where they lived at the time of the interview (i.e., Groups 4-6 vs. Groups 1-3 at the time of the interview), the lifetime prevalence of binge eating and BED were slightly higher in the US than in Mexico (4.9% vs. 3.9% for binge eating; 2.2% vs. 1.6% for BED). Prior to adjustment for age and sex, differences in prevalence did not reach statistical significance across countries or across the six migrant groups.

Table 3 presents adjusted associations of migration group and other predictors with onset of binge eating and BED. Binge eating had about twice the rate in Group 6 (US born with 2 US born parents) as in the referent Group 2 (aHR=1.91, 95% CI: 1.00-3.63; Model 1). Results of Model 2 show a relatively strong relationship of binge eating with prior anxiety or depressive disorder and attenuation of the relationship between binge eating and migration when these disorders are taken into account. The aHR associated with Group 6 is reduced relative to Model 1 by 18% to 1.57 (95% CI: 0.81-3.04; Model 2). The relationship between conduct disorder and binge eating (Model 3) does not reach statistical significance and results in a smaller attenuation of the aHR associated with Group 6 of 4%, relative to Model 1.

A similar pattern of results was found for BED. Incidence of BED is elevated in Group 6 (US born with 2 US born parents) relative to Group 2 (aHR=2.58, 95% CI: 1.12-5.93; Model

1). This association is attenuated with statistical adjustment for prior depressive or anxiety disorder (Model 2) by 24% to 1.97 (95% CI: 0.84- 4.62). The results for BED differ from those for binge eating with respect to adjustment for prior CD (Model 3), which results in a slight *increase* (7%) in the strength of the association with Group 6 to 2.75 (95% CI: 1.22-6.20).

Among respondents who reported binge eating (n=138), there was no association between related symptoms and the timing of binge onset relative to migration (**Table 4**). Among such respondents, the majority reported three or more binge-associated criterion symptoms (64.5%), indicating threshold BED levels; there was no difference in number of symptoms by migrant group ($p=0.89$) or in endorsement of any specific criterion symptom ($p's>0.11$). The groups did not differ in terms of shape and weight concerns overall ($p=0.57$) or each question separately ($p's>0.53$). No significant differences were found in the number of weight control behaviors endorsed ($p=0.61$) or in whether the groups differentially endorsed purging-type behaviors ($p=0.08$).

Discussion

Cultural differences in eating habits and body image ideals have been hypothesized to affect risk for eating disorders, with greater emphasis on control of eating and value of thinness hypothesized to lead to higher prevalence of eating disorders in Western countries (Becker et al., 2002; Becker, Burwell, Navara, & Gilman, 2003; Becker et al., 2011; Lynch, Heil, Wagner, & Havens, 2007; Mousa, Al-Domi, Mashal, & Jibril, 2009; Toro et al., 2006). This hypothesis has received support from studies of exposure to Western popular media in Fiji (Becker et al., 2002; Becker et al., 2003; Becker et al., 2011). Some studies have compared non-representative samples from related Western and non-Western populations, finding mixed support. In a sample comparing Iranian and Iranian-American female college students (Abdollahi & Mann, 2001), no differences were found; a sample comparing Arab female college students in Egypt and the UK found cases of BN in the UK but not in Egypt (Nasser, 1986); a comparison of female adolescents in Spain and Mexico found no significant differences in the prevalence of the disorders but did find differences in risk factors (e.g., body image ideals) across the two countries (Toro et al., 2006). These three studies were on non-representative, small samples, and did not assess BED. To our knowledge, only one study has examined binge eating and BED in a migrant population (Alegria et al., 2007), but that study was limited to data from the US and included all Latinos in a single group. This is the first study to examine the effects of exposure to Western culture on binge eating and BED in a transnational, migrant sample. Further study strengths include the large population-based samples, using the same fully structured assessments across samples, and our refined definition of exposure to US culture by generation. Moreover, we distinguish within Mexico between families with and without migrants, minimizing the impact of migrant selection on our conclusions.

The results provide evidence supporting the main hypothesis that increased exposure to the US is associated with increased rates of binge eating and BED. This is supported more generally for eating disorders by prior research in Latinos (Ahluwalia, Ford, Link, & Bolen, 2007; Alegria et al., 2007) and other populations (Becker et al., 2002; Becker et al., 2003; Becker et al., 2011; Marais, Wassenaar, & Kramers, 2003; Mussap, 2009), although only two studies to our knowledge have studied exposure to Western culture and BED specifically (Alegria et al., 2007; Becker et al., 2003). Four features of these results should be noted. First, binge eating and BED are not absent from the Mexican population, with overall prevalence only slightly lower than in the US. Second, rates of binge eating and BED are significantly elevated only in Group 6 (i.e., US-born Mexican-Americans with two US-born parents). This suggests that the cultural change underlying this increase occurs

relatively slowly. Third, although the other estimates were not significant, the pattern of successively higher hazard ratios across Groups 4-6 suggests risk may accumulate steadily with increased exposure. Fourth, the increase in risk is observed for both binge eating and BED, suggesting that there is an influence on binge eating broadly and not only on the psychological symptoms that comprise the additional proposed criteria.

To date, cultural theories regarding the effect of Western exposure on eating disorder risk have focused on factors specific to eating disorders, e.g., differential media influences, peer and familial pressures on appearance, and body image ideals (Becker et al., 2002; Becker et al., 2003; Becker et al., 2011; Lynch et al., 2007; Mousa et al., 2009; Toro et al., 2006). However, migration to Western countries is also associated with increased risk for a wide range of other psychiatric disorders (Alegría et al., 2008; Breslau et al., 2008a; Cantor-Graae et al., 2005; Fearon et al., 2006) many of which are often comorbid with BED (Hudson et al., 2007; Preti et al., 2009; Swanson et al., 2011; Wonderlich et al., 2009). Increasing risk for BED might be attributable to non-specific factors that influence risk for psychopathology broadly. We examined this possibility by including statistical adjustment for psychiatric disorders with onset prior to the onset of binge eating. Adjusting for prior onset of a depressive or anxiety disorder tempered the associations of migration with BED and binge eating. This suggests that part of the cultural influence on BED and binge eating may derive from non-specific risk factors associated with higher risk for psychopathology in the US relative to Mexico. These effects might arise from factors specific to ethnic minorities in the US (Cook, Alegria, Lin, & Guo, 2009) or to assimilation to American culture more generally. The prior depressive/anxiety disorders may not have an etiologic role in onset of BED, but could act as non-specific markers of high risk for psychopathology.

Interestingly, adjustment for prior onset conduct disorder produced no such attenuation, despite it being associated with increased exposure to the US (Breslau et al., In Press) and elevated risk for BED (Hudson et al., 2007). The absence of a positive association between conduct disorder and BED in this sample warrants further exploration, as the pattern of comorbidity may not hold cross-culturally. However, studies that suggest that eating disorders fit within the internalizing disorder taxonomy may help make sense of our overall findings (Forbush et al., 2010).

To further examine cultural influences on relevant symptoms, we examined symptom endorsements among people who reported binge eating. We were particularly interested in the hypothesis that some symptoms would be more common in the US, potentially indicating a greater psychological salience with increased US exposure. Particularly for the binge-associated criterion symptoms, finding a significant difference across borders would suggest a non-generalizability to the proposed DSM-5 definition that may necessitate revision of criteria. Instead, we found no significant differences. Thus, given the presence of the core symptom, our findings support a degree of cross-cultural stability in symptom constellations. However, this set of analyses may be underpowered, and therefore the trend that purging behaviors were associated with country of binge eating onset ($p=0.08$) may in particular be worth further consideration.

There are limitations to note. The assessments were retrospective and subject to recall error (Moffitt et al., 2010). The WMH-CIDI incorporated a number of features to improve recall and the accuracy of age of onset reporting (Kessler et al., 2004c). However, it is likely that past binge eating and BED were underreported in these data. The use of the same instrument, including the same Spanish version in both Mexico and the US, minimizes the chance that this under-reporting results in systematic bias in the prevalence across migration groups. Second, there is some evidence that the skip patterns in the WMH-CIDI exclude some clinically significant cases of eating disorder (Swanson, Brown, Crosby, & Keel,

under review); further research is necessary to assess whether these findings would hold if thresholds were lowered for the frequency or objective size of the binge episodes. Third, instrument differences between the Spanish and English version of the WMH-CIDI cannot be ruled out, and an upward bias in the English version could theoretically explain our positive findings; however, there is no specific reason to believe this is the case, and the adherence to WHO instrument translation guidelines minimizes the validity of such a claim (Harkness et al., 2008). It is also worth considering that our research is consistent with an alternative hypothesis: as later generations are increasingly more likely to be children of families of mixed heritage, the significant effect found in Group 6 may be explained by genetic rather than environmental exposures. Although BED is likely to have some genetic component, research supports that environment explains much of the risk (Bulik, Sullivan, & Kendler, 2003); further, to our knowledge there is no evidence that supports a genetic difference between these groups contributing to the differential risks. Thus, although we cannot rule out this alternative hypothesis, it appears unlikely given current knowledge. Finally, despite the overall large sample size, there may have been limited power to detect differences for some questions raised in this study. Specifically, the subset analyses looking within respondents reporting binge eating had limited power and thus should be considered preliminary.

12 million individuals living in the US were born in Mexico (Grieco, 2009), representing a third of the US foreign-born population and 10% of the Mexico-born population on either side of the Mexico-US border. Our findings suggest that binge eating and BED are prevalent among people of Mexican origin in both countries, with lifetime prevalence estimates of BED near the general US population (2.8%) (Hudson et al., 2007) and somewhat higher than that estimated in Western Europe (1.1%) (Preti et al., 2009). There is evidence that risk for binge eating increases across immigrant generations in the US without corresponding changes in the eating-disorder-related symptoms associated with these episodes, including those proposed as criteria for BED. The evidence also suggests that the increase in risk for binge eating may not be due exclusively to specific cultural pressures on eating behavior (e.g., differential body image ideals) that have been the focus of previous research. Rather, this increase in risk may be due in part to non-specific factors that underlie changes in a broad range of psychiatric morbidity associated with migration.

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Table 1

Demographic Information by Migration Group, Unweighted N (Weighted %)

Total Sample (N=2268)		1: No Family Migrant (N=600)		2: Family Migrant (N=564)		3: Return Migrant (N=70)		4: Migrant (N=524)		5: US-born with 1 or 2 Foreign-born Parents (N=254)		6: US-born with 2 US-born Parents (N=256)		
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Gender														
Male	920	50.2	197	45.6	203	47.9	51	79.2	247	55.6	112	51.6	110	55.9
Female	1348	49.8	403	54.4	361	52.1	19	20.8	277	44.4	142	48.4	146	44.1
$\chi^2(5) = 19.04, p = 0.0019$														
Age														
18y/o-25y/o	583	30.0	160	31.8	165	31.9	11	20.7	93	20.4	94	40.9	60	25.3
26y/o-35y/o	661	26.1	152	24.2	147	25.9	18	27.4	221	37.9	55	18.5	68	20.5
36y/o-45y/o	491	21.4	130	20.9	125	21.2	22	28.6	111	23.8	43	13.2	60	24.4
46y/o-89y/o	533	22.5	158	23.1	127	21.0	19	23.3	99	17.9	62	27.4	68	29.8
$\chi^2(15) = 47.76, p < 0.001$														

*Six migrant groups were examined: (1) Mexicans with no migrant in their immediate family; (2) Mexicans with a migrant in their immediate family; (3) Return migrants (Mexicans with a history of migration to the US); (4) Mexican-born immigrants in the US; (5) US-born Mexican-Americans with at least one foreign-born parent; and (6) US-born Mexican-Americans with two US-born parents

Table 2
Lifetime Prevalence of Binge-Related Disorders by Migration Group, Unweighted N (Weighted %)

	Total Sample (N=2268)		1: No Family Migrant (N=600)		2: Family Migrant (N=564)		3: Return Migrant (N=70)		4: Migrant (N=524)		5: US-born with 1 or 2 Foreign-born Parents (N=254)		6: US-born with 2 US-born Parents (N=256)		Chi Square (df=5)	P-Value
	N	%	N	%	N	%	N	%	N	%	N	%	N	%		
Any Binge Eating	138	4.2	28	2.9	43	4.6	7	7.7	22	3.7	15	4.8	23	7.2	6.490	0.261
BED	60	1.7	11	1.3	18	1.5	3	4.4	8	1.3	8	2.6	12	3.2	4.004	0.549

*Six migrant groups were examined: (1) Mexicans with no migrant in their immediate family; (2) Mexicans with a migrant in their immediate family; (3) Return migrants (Mexicans with a history of migration to the US); (4) Mexican-born immigrants in the US; (5) US-born Mexican-Americans with at least one foreign-born parent; and (6) US-born Mexican-Americans with two US-born parents

Table 3

Models Predicting Onset of Any Binge Eating or Binge Eating Disorder, Hazard Ratio (95% CI)

Predictors	Any Binge Eating			BED		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
	aHR	CI	aHR	CI	aHR	CI
Migration category						
1: No Family Migrant	0.69	0.37-1.31	0.69	0.37-1.31	0.97	0.35-2.70
2: Family Migrant	Reference		Reference		Reference	
3: Return Migrant	2.03	0.61-6.77	2.08	0.62-6.97	3.54	0.52-24.34
4: Migrants	1.04	0.61-1.77	0.97	0.57-1.66	1.26	0.42-3.78
5: US-born with 1 or 2 Foreign-born Parents	1.29	0.64-2.59	1.15	0.59-2.25	1.82	0.80-4.12
6: US-born & 2 US-born Parents	1.91	1.00-3.63	1.57	0.81-3.04	1.97	0.84-4.62
Any anxiety or depressive disorder			2.80	1.76-4.44	3.75	1.77-7.94
Conduct disorder			1.37	0.63-2.96	0.37	0.06-2.33

*Six migrant groups were examined: (1) Mexicans with no migrant in their immediate family; (2) Mexicans with a migrant in their immediate family; (3) Return migrants (Mexicans with a history of migration to the US); (4) Mexican-born immigrants in the US; (5) US-born Mexican-Americans with at least one foreign-born parent; and (6) US-born Mexican-Americans with two US-born parents

*Presenting adjusted hazard ratios from discrete time survival models; Model 1 predicts outcome by migrant group, adjusting for sex and age cohort; Model 2 predicts outcome by migrant group, adjusting for sex, age cohort, and prior onset depressive or anxiety disorder; Model 3 predicts onset by migrant group, adjusting for sex, age cohort, and prior onset conduct disorder

Table 4
Frequency of Related Behavioral and Cognitive Symptoms Among Respondents Endorsing Binge Eating, Unweighted N (Weighted %)

	Total Sample (N=138)		Onset in Mexico (N=82)		Onset in US (N=56)		Chi Square	Df	P-value
	N	%	N	%	N	%			
Number of Binge-Related Criterion Symptoms									
0-2	44	35.5	28	36.3	16	33.5			
3	31	20.1	21	20.8	10	18.3	0.24	2	0.89
4-5	63	44.4	33	42.8	30	48.2			
Eat More Quickly Than Usual	106	76.8	60	74.9	46	81.3	0.51	1	0.47
Eat Until Uncomfortably Full	129	92.2	78	94.4	51	86.9	0.87	1	0.35
Eat when not Hungry	94	65.9	53	63.5	41	71.6	0.50	1	0.48
Eat Alone Because Embarrassed	37	25.3	23	26.7	14	21.9	0.27	1	0.60
Feel Guilty, Upset, or Depressed After Binge	75	48.8	39	44.2	36	59.7	2.51	1	0.11
Any Shape or Weight Concerns	94	65.7		67.4	39	61.6	0.33	1	0.57
Self-Esteem/Confidence Dependent on Weight/Shape	81	54.7	44	52.7	37	59.3	0.39	1	0.53
Afraid of Gaining Weight at Time of Binge	77	53.1	45	55.0	32	48.7	0.33	1	0.57
Number of Weight Control Behaviors									
0	51	39.4	35	42.6	16	31.9			
1	44	30.9	25	29.5	19	34.1	0.99	2	0.61
2 or more	43	29.7	22	27.9	21	33.9			
Any Purging Type Behavior	46	27.2	22	23.2	24	36.7	2.97	1	0.08

*Respondents were grouped into whether their reported age of first onset of binge eating occurred in Mexico or in the US by comparing whether this age occurred before or after their reported age of migration, when applicable; respondents who spent their entire lives in either country were categorized accordingly